The Effects of Climate Change Considerations in Environmental Assessment: A Case Study of British Columbia's Liquid Natural Gas Sector

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Abstract

The development of energy resources and global climate change are inextricably linked. The purpose of this research was to examine the potential impacts of incorporating climate change considerations in project level environmental assessment (EA) regulations and practice within the context of the liquid natural gas (LNG) sector in British Columbia. The specific objectives of this research were to examine how climate change is considered in EA for the LNG industry, including the provisions for doing so, and assess the potential benefits and implications of increased climate change considerations in EA.

A systematic review of EA documentation (e.g., impact statements, project approvals, mitigation plans) from LNG related projects in BC over the last ten years showed that climate change has been considered in some form in every project EA conducted, and during almost every project review phase. Semi-structured interviews with representatives from the energy industry, provincial government, environmental non-governmental organizations, and EA practitioners highlighted the challenges, concerns, and successes of climate change assessment and management.

Based on the information collected from BC LNG EAs it was shown that EA can, and should, consider climate change but that is must be coupled with other planning, decision making, and regulatory tools to effectively address climate change. It also highlighted the lack of trust the public has in the EA process and that there is also a gap in knowledge and information sharing about how climate change is currently considered in EA. Numerous tools and process were identified through this research to augment the EA process, including strategic environmental assessment, economic incentives, practice guidance, and regulatory instruments.

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List of Abbreviations

AIR	Applicant information requirements
BAU	Business as usual
BC	British Columbia
C	Celsius
CCS	Carbon capture and storage
CEA	Cumulative effects assessment
CEAA	Canadian Environmental Assessment Agency
CEQ	Council on Environmental Quality
CH_4	Methane
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalents
EA	Environmental assessment
EAC	Environmental assessment certificate
EAO	Environmental Assessment Office
GHG	Greenhouse gas
IAIA	International Association of Impact Assessment
IEA	International Energy Association
IPCC	Intergovernmental Panel on Climate Change
LNG	Liquid natural gas
N_2O	Nitrous oxide
NEB	National Energy Board
NEPA	National Environmental Protection Agency
NGO	Non-government organization
OECD	Organization for Economic Cooperation and Development
OGC	Oil and Gas Commissions
PDA	Project development agreement
ppm	Parts per million
SEA	Strategic environmental assessment
VC	Valued component

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Chapter 1 Introduction

The most recent Intergovernmental Panel on Climate Change (IPCC) report states that climate change is an "unequivocal" fact in today's world, and that it is extremely likely that anthropogenic drivers are the dominant causes (2014a, p. 2-4). In order to manage climate change related effects, both mitigation and adaptation strategies are required. The effective implementation of mitigation and adaptation strategies depends in large part on strong government policies, programs, and institutional capacity (IPCC 2014a). This is particularly the case in the energy resource sector, as countries grapple with how to meet increasing energy demands while concurrently reducing greenhouse gas (GHG) emissions. Decisions made today regarding energy production, distribution, and use have the potential to significantly impact current and future generations.

Canada's energy sector has historically been built on non-renewable resources, including oil and natural gas. Canada ranks third globally in proven oil reserves (National Energy Board 2016) and is currently ranked as the world's fifth largest producer and exporter of natural gas (Central Intelligence Agency 2014). Based on the current macroeconomic outlook, the National Energy Board's (2016) energy market assessment indicates a 56% increase in oil production by 2040 above 2014 levels; and a 22% increase in natural gas production, of which liquid natural gas (LNG) exports are expected to be a key driver of production growth. There is, of course, much uncertainty in these projections, particularly in LNG growth. The future of LNG markets is contingent, in part, on the development of new processing and export infrastructure, on market demand in the Asia Pacific region (National Energy Board 2016), and on future energy policy commitments and investments in alternative energy (Bang 2010; Kumar et al. 2011).

Coupled with increasing energy demand is a growing public awareness of climate change and increasing pressure on governments to address concerns around both climate change adaptation and mitigation (Climate Leadership Team 2015). Adaptation is defined by the IPCC as an "…adjustment in natural or ***human systems*** in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities…" (Parry et al. 2007, p.

869). The IPCC defines mitigation as an "…anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks" (Parry et al. 2007, p. 878). Several prominent policy and environmental organizations in Canada, for example the Pacific Institute for Climate Solutions and the Pembina Institute, have published volumes of work calling attention to the perceived shortcomings of government policies and practices with respect to addressing climate change (Flanagan 2015; Horne & McNabb 2014; MacNab & Kniewasser 2016). Perhaps the most publicized and recent development that highlights the struggle between energy security, climate change, and the economy is the proposed Keystone XL pipeline that would involve the transport of Canadian crude oil to the Gulf of Mexico in the United States. Elaborating on the rationale for the United States' government rejection of the Keystone XL pipeline application, then-President Obama cited climate change concerns as a main factor in his determination (Office of the Press Secretary 2015). In January of 2017, the new presidential administration under the leadership of President Donald Trump rescinded this decision and issued an Executive Order approving the Keystone Pipeline (The White House Office of the Press Secretary, January 24, 2017). Further, the new American administration has enacted a systematic disinvestment in climate change initiatives, regulations, and policies, including eliminating climate change research and significantly cutting the US Environmental Protection Agency's budget (Davenport 2017).

One of the primary instruments in Canada and internationally for assessing and managing the effects of energy development is environmental assessment (EA). In practice, EA is often seen as a project-specific impact management tool that identifies the possible effects of a proposed development in order to engage the public, inform decision makers and identify ways to mitigate potentially adverse outcomes (Joseph, Gunton, & Rutherford 2015; Rozema et al. 2012). The primary objectives of project EA are to provide information to decision makers, to promote transparency and public participation in decision making about development, to identify ways to mitigate and monitor potential impacts, and to support sustainable decision making (IAIA 2009).

In recent years, increasing attention has been paid to incorporating climate change considerations into EA systems and practices (Li & Zhoa 2015), and there is a growing volume of academic

literature calling for increased climate change considerations in all facets of EA. The focus in the literature is often on using existing EA processes to address climate change issues, particularly emissions management, associated with energy exploration, production, and transmission (Agrawala et al. 2012; Pope et al. 2013; Sok et al. 2011). In Canada, both the federal government and the British Columbia (BC) provincial government provide guidance for EA practitioners on how to address climate change in the assessment of development projects (e.g., The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003; Environmental Assessment Office 2013b; CEAA 2014b), with the rationale for doing so supported by various international, such as the Copenhagen Accord (United Nations 2010); federal, including the Clean Air Regulatory Agenda (Environment and Climate Change Canada 2013); federal, such as the *Federal Sustainable Development Act* (Government of Canada 2008); and provincial, including the Climate Action Plan (Government of BC n.d.) and *Greenhouse Gas Reduction Targets Act* (Government of BC 2007), acts, regulations, and policies.

The recently elected federal Liberal government made several commitments during its 2015 election campaign to strengthen EA, including climate change considerations, stating "Our government is making climate change a top priority…" (Office of the Prime Minister 2015) and making commitments to renew EA in Canada in order to restore public confidence in the process (Government of Canada 2016). In January 2016, the federal government announced a requirement for the consideration of upstream GHG emissions in project assessments as an interim measure for strengthening federal EA and climate change action (Government of Canada 2016). This new requirement means that pipelines being reviewed will now be assessed based on their upstream GHG emissions, in addition to other assessment criteria (Bishop & Dachis 2016). The federal government also had a strong presence at the 2015 Paris Climate Conference, committing to the Paris Agreement and agreeing to work with the US to achieve the goals of the Paris Agreement, including a reduction of methane emissions from the oil and gas sector to 40 - 45% below 2012 levels by 2025 (Office of the Prime Minister 2016). Additionally, the Government of Canada has signalled their intention to mandate a minimum carbon tax starting at $10 per tonne in 2018, increasing to $50 per tonne for all provinces by 2020 (Environment and Climate Change Canada 2017). The recent change in government in BC from the Liberals to the NDP in the summer of 2017 has come with numerous changes commitments to address climate

change, most notably direction to raise the carbon tax over three years starting in 2020 to meet the federal mandate of $50 per tonne and sector specific carbon reduction targets, including a 30% reduction in GHG emissions for industry by 2030 (BC NDP 2017). That said, few previous emissions reductions targets set by government have been met (Davidson & Shah 2015; Jaccard 2015; Mandel 2016).

The need to incorporate climate change in EA systems and practice is also noted in the scholarly literature (Burdge 2008; Byer & Yeomans 2007; Ohsawa & Duinker 2014; Slotterback 2011; Yi & Hacking 2011). The International Association for Impact Assessment (IAIA) provides specific guidance on how to address climate change in EA, and posits that EA has "much to contribute" to governments, industry, and the public in understanding and addressing climate change (Byer et al. 2012, p.1). Sok et al. (2011, p.317) argue that EA "can and should play a role in tackling climate change." Agrawala et al. (2012, p.26) echo this sentiment, stating that project level EA "is critical for the consideration of climate change", and go on to note that Canada currently has the most robust system for addressing climate change in EA. However, limited scholarly or applied work has been done to critically examine climate change considerations in Canadian EA practice, aside from earlier works conducted by Lee (2001), which is still referenced in both the academic and policy literature, and recent research conducted by Ohsawa and Duinker (2014) examining how GHG emissions were considered in twelve recent federal EAs. As noted by Ohsawa and Duinker (2014), the need for clear definitions and evaluation methods for climate change concerns remains an outstanding area of EA practice.

1.1 Research Purpose and Objectives

As Canada strives to meet increasing energy demands, whilst also honouring its national and international obligations to combat climate change, there are increasing expectations for EA to consider the potential climate change impacts of energy projects (Ohsawa & Duinker 2014; Sok et al. 2011). At the same time, however, as EA itself is subject to criticism over its efficiency for ensuring timely and cost-effective development decisions, and its effectiveness as a meaningful tool for environmental management (Bond et al. 2014; Gibson 2012), there is limited understanding of what the effects of ramping-up the requirements for assessing the potential

climate impacts of energy projects could be. Specifically, what are the implications of increased climate change considerations for EA processes and decisions; and what are the implications for improved climate change impact management?

The **purpose** of this research is to examine the potential impacts of incorporating climate change considerations in project level EA regulations and practice. This is done within the context of the LNG industry in British Columbia, Canada, one of the country's fastest growing energy sectors and regions. The specific **objective**s are as follows:

i. Examine how climate change is considered in EA in the LNG industry, including the provisions for doing so;
ii. Assess the perceived benefits and implications of current and increased climate change considerations in EA policy and practice, including implications for the LNG industry;
iii. Identify opportunities for improvements in the processes and tools used for evaluating climate change in energy development projects.

1.2 Research Context

This focus of this research is on BC's LNG industry - the second largest producer of natural gas in Canada (Council of Canadian Academies 2014). The government of BC has consistently signalled that natural gas is a vital component of the province's economic and energy future (*BC Job Action Plan* n.d. and the *BC Natural Gas Strategy* n.d.), and with more efficient shale gas extraction technology and vast reserves in northern BC, the province is poised to significantly expand its natural gas industry in the coming years. However, critics remain sceptical of the industry's ability to both generate the projected revenue and to be effective in minimizing global, and provincial, emissions (Lee 2012). Indeed, the discordance between the development of the LNG industry and the provincially legislated GHG emissions reductions targets is a reoccurring theme in both the public realm (Lee 2012; Horne & MacNab 2014) and this research.

As of March 2016, there were 21 LNG facility projects proposed for BC, although not all have entered the provincial EA process. As of August 2017, four LNG facilities have received a provincial EAC, although none have been built yet. Five additional projects are in the BC EA

review process. There are an additional six LNG-specific pipelines proposed in the province, four of which have received a provincial EAC (Government of BC 2016a; Government of BC 2016b). While LNG has yet to materialize the economic boom to BC that had been initially projected, the provincial government continues to support this industry and the goal of building three LNG facilities - claiming that it will provide important revenues to the province and its citizens (Ministry of Energy, Mines, and Natural Gas 2013). Recent findings by the NEB show that the natural gas reserves in the Liard basin, for example, are one of the largest in the world and the second largest within Canada (National Energy Board 2016).

British Columbia has legislated GHG emission reduction targets established by the 2007 *Greenhouse Gas Reduction Targets Act*, which commits to reducing emissions by 33% below 2007 levels by 2020, and by 80% by 2050 (Government of British Columbia 2007). The province has also had a price on carbon since 2008, of $30 per tonne. The program has generally been perceived as a success at reducing carbon; however, a 2015 report by the Climate Leadership Team, a government established working group, recommended increasing the carbon tax by $10 a year starting in 2018. The report also recommended that the BC *Environmental Assessment Act* be amended to include the social cost of carbon in EA so that projects consider how carbon pricing may affect project feasibility 30 to 50 years into the future (Climate Leadership Team 2015). In January 2016, the BC government provided new or updated legislation and regulations related to the LNG sector, including a production intensity target aimed at making BC LNG the 'cleanest in the world', new emissions reporting requirements, and the development of a BC Carbon Registry where emission offsets and credit can be issued, transferred, and tracked (Government of BC 2016b).

1.3 Thesis Format

This thesis uses a chapter format starting with the introduction presented in Chapter 1. Chapter 2 outlines the current literature and state of knowledge with respect to climate change and environmental assessment. Chapter 3 presents the background for to the LNG industry and EA in BC, and the methods used in this research. Chapter 4 presents the results of the research. Chapter

5 discusses the broader scholarly and policy implications of the research. Chapter 6 concludes the thesis, with recommendations for further research.

Chapter 2 Literature Review

The following review discusses the intersection of the energy sector, climate change and the theory and practice of EA as described in the academic literature. Current discourse with respect to the intersection of these topics is discussed and research and practice gaps with respect to the application of EA to address climate change are identified. While the focus of the discussion is on current academic knowledge, some areas of current events and grey literature are brought forth to illustrate specific issues or discussion points.

2.1 Climate Change

Climate change is a global concern with significant current and future impacts to society and ecological systems. Anthropogenic GHG emissions, which have been steadily increasing since the 1970s, are identified as the primary driver of climate change (IPCC 2014). The largest increase in emissions has occurred since 2000, despite world-wide mitigation efforts, with 78% of those emissions caused by fossil fuel combustion and industrial processes (IPCC 2014). Although impoverished countries, especially those in warm climates, have borne the brunt of climate change effects thus far, no areas of the globe have been immune to climate change effects (IPCC 2014). The most direct and obvious impacts include increased frequency and intensity of droughts, wildfires, precipitation, extreme weather events, floods, and heat waves. The IPCC's (2014) Fifth Assessment Report clearly outlines the risks to social, economic, and ecological systems from increasing climate change impacts, and provide a clear rationale to implement effective mitigation and adaption measures with a sense of urgency.

2.2 Energy Development and Climate Change

Energy use is one of the most significant sources of GHG emissions, and presents one of the greatest opportunities for potential reductions. The IPCC (2014) and International Energy Agency (IEA 2014) cite two common policy scenarios when examining energy futures: the '450 scenario', wherein carbon dioxide equivalents (CO_2^e) are held at 450 parts per million (ppm), and

the 'BAU (business as usual) scenario', wherein emissions continue at current trends. The 450 scenario is considered the target that will likely hold global warming to 2º Celsius (C); the BAU is projected to increase global temperatures by 2.5 to 7.8º C. The greater the average increase in global temperatures, the greater the negative impacts to ecological and human systems (IPCC 2014). The rate of growth and types of energy used to meet future energy demand, and resulting GHG emissions, will be largely influenced by the policies and processes put in place today (Aguilera & Aguilera 2012; IEA 2014). It is generally accepted that in the absence of climate policy, fossil fuel use and resulting emissions will continue to grow (IPCC 2014; Wigley, Richels, & Edmonds 1996). The effective management of energy sector activities, including energy exploration, production, transmission, use and demand, is thus a main determinant of sustainability (Dincer & Rosen 1999), with implications for current and future economies, environments, and people.

Energy security is defined by the IEA (2014) as "...the uninterrupted availability of energy sources at affordable prices...". Effective energy policies need to balance energy security with economic growth, sufficient energy access, and environmental protection (Huang 2014). Energy demands worldwide is increasing due to economic growth, increasing populations, increasing incomes, and changing lifestyles (Huang 2014). Recent forecasting by Vaillancourt et al. (2014) predicts a 43% increase in energy consumption in Canada by the year 2050, with oil and gas continuing to play a significant role in energy use types. Hofman and Li (2009) argue that for Canada to achieve a sustainable energy future it is necessary to diversify and localize its energy production systems, as well as reduce consumption. They also report that the lack of Canadian incentives and regulation to promote a sustainable energy future is in part due to Canada attempting to stay competitive with trading partners who have less stringent emissions regulations.

Vale (2016, p. 12), however, argues that a global approach to addressing GHG emissions "…has proven unfeasible both theoretically and in practice." Evidence of this failure is given by the steady increase in global GHG emissions over the past three decades, despite efforts to curtail emissions in recent years (IPCC 2014). The energy sector is a major source of GHG emissions, and current energy policies will have significant impacts on future generations and their ability to

meet emissions targets (O'Neill et al. 2009; Pasimeni et al. 2014). For example, the 2014 agreement between China and the United States to reduce GHG emissions, with China committing to stopping emissions growth by 2030 and the United States committing to reducing emissions by 26 to 28% from 2005 levels by 2025 (The White House 2014), indicates a willingness from the world's two largest GHG emitters to address emissions - although the policies to achieve these reductions remain to be seen. Historically, efforts at global agreements to reduce emissions have been hampered by an unwillingness to commit to strategies and targets by the world's two largest emitters; China and the USA (Nature Editorial 2011). The ramifications of national and international agreements, and the nature of those policies or tools to meet emissions reduction targets, may have significant implications for global energy markets, development, and regulation practices.

There has been ample discourse regarding possible energy futures, with much attention paid over the last decade to the natural gas sector. Jaccard (2005) and Salameh (2003) have suggested that fossil fuels are necessary to help build a sustainable energy future, while Levi (2013) and Aguilera and Aguilera (2012) indicate that natural gas may have a role to play in helping to achieve more modest GHG reductions while ensuring energy security. In contrast, Stephenson et al. (2012) examined the BC natural gas industry and found no substantiated evidence that natural gas is a 'bridge' energy source to a sustainable energy future; findings that have been supported by other academics (Lee 2012). The ability of natural gas to act as a bridge energy source and help countries meet the '450 scenario' is dependent on both climate and energy policies (Horne & MacNab 2014), and on the tools and processes in place to manage or regulate energy developments. For natural gas to have a positive effect on GHG emissions, it must be coupled with strong government policies to guide economies and industry growth towards sustainable energy futures (Horne & MacNab 2014; Newall & Raimi 2014).

The focus of climate action in relation to the energy sector is often on mitigation, or reducing greenhouse gas emissions (Council of Canadian Academics 2014; Enriquez-de-Salmoneca et al. 2016; IPCC 2014), but there is also the potential for the energy sector to be impacted by climate change adaptation requirements, as described by Colombo and Byer (2012) and Larsen (2014). Since historical climate data may no longer adequately represent future norms, infrastructure

planning needs to consider this added level of uncertainty through decision making, planning, and adaptation strategies and processes (Colombo & Byer 2012). Pasemini et al. (2014) argue that climate change has both physical, as well as economic, impacts to the energy sector. The interdisciplinary nature of managing climate change presents unique challenges to creating and implementing institutional processes that can effectively respond to climate change mitigation and adaptation requirements (Larsen et al. 2012). How the energy sector is regulated and what criteria are used for evaluating energy options is important for energy security, as well as having implications for future environments. As pointed out by Colombo and Byer (2012), decision making regarding future projects involves a consideration of economic, environmental, and social factors and the trade-offs between these must be fully identified and understood for effective decision making to occur.

2.3 Environmental Assessment

Environmental assessment is broadly defined as the process by which the impacts of a proposal are identified and evaluated, with the aim of arriving at improved decisions making. Fundamentally, EA is intended to be an "…anticipatory, participatory environmental management tool" (Jay et al. 2007, p. 288). Environmental assessment originated in the United States in the 1970s after the enactment of the *National Environmental Protection Act* (*NEPA*). The intent of the NEPA was to ensure decision makers and the public were informed of the environmental implications of actions prior to decisions being made to prevent or eliminate environmental impacts (Brill 2014; Jay et al. 2007). Since the 1970s, EA has spread globally with some form of EA system now in place in 191 countries worldwide (Pope et al. 2013). Research on EA has also spread globally. In 2012, alone, scholars from 163 countries were involved in some form of EA research that resulted in peer-reviewed publication (Li & Zhao 2015). Although the premise of EA, as a decision tool, is generally consistent world-wide there are many different processes, tools, and definitions by which EA is practiced globally (Jones & Morrison-Saunders 2016).

It is argued that the rapid growth in the field of EA since the 1970s has resulted in a disjointed application of policy and science with weak theoretical underpinnings (Cashmore 2004). The

lack of singular definition in the role and purpose of EA may be one reason that new fields of inquiry, such as climate change, are often relegated to EA without deliberation of the impacts to the practice of EA or the outcomes that can be achieved. In the case of climate change in EA, for example, while the literature has repeatedly called for its inclusion (Burdge 2008; Byer et al. 2012; Enriquez-de-Salmoneca et al. 2016), little attention has been paid to what the effects of doing so would be on both the effectiveness and efficiency of EA practice. In a review of European EAs, Enriquez-de-Salmoneca et al. (2016) found that climate change, when included, was primarily an examination of how the project contributed to climate change through a quantification of GHG emissions. In many cases, projects merely 'cited' climate change and did not conduct a robust analysis of either the effects of the project on climate change nor of how the project itself could be impacted by climate change (Enriquez-de-Salmoneca et al. 2016).

Environmental assessment is commonly accepted as a tool that promotes sustainable development (Jay et al. 2007). Whether EA is effective depends on both the perceived role of EA in society and the definition of sustainability (Cashmore 2004; Pope et al. 2013; Morgan 2012). As EA's role within the sustainability paradigm has not yet been clearly defined, looking to EA outcomes may provide a more substantive process for judging effectiveness (Jay et al. 2007).

The quality of EA reports has also been linked to the existence and nature of EA legislation; the scoping process and involvement of the public; and the length and cost of the EA report (Barker & Wood, 1999). The balance between efficient processes that are also effective in achieving the goals of EA can be difficult to achieve, and is limited by what the perceived goals of EA are and how effectiveness is defined. Effectiveness is a much-debated topic in EA literature, but it can be broadly defined as "…how much difference E[I]A is making" (Jay et al. 2007, p.290). However, as pointed out by Hansen and Wood (2016), practitioner experiences in effectiveness research remains "under-explored" (p.1) and there is an inherent disconnect between EA practitioners and the EA academic community when reporting outcomes. Determining significance, for example, is one of the key objectives in EA practice and a routine part of project reviews, and yet there remains no consensus in the literature on how to go about accomplishing this (Jones & Morrison-Saunders 2016). While Ehrlich and Ross (2015) point to the importance of thresholds based on

values, Jay et al. (2007) points out that politics can exert substantial influence in the later stages of decision making in EA.

The view that individuals and governments adopt regarding the role of EA in society presumably influences what role they believe EA should play in addressing climate change, and what they view as an 'effective' EA process in this regard (Morgan 2012). Cashmore (2004) identifies two main EA paradigms with five models of practice, ranging from EA as a civic science to EA as an applied science. While EA has its roots as an "information processing" tool (Pope et al. 2013), stemming from the rationalist approach to decision making of the 1960s (Jay et al. 2007), its effectiveness must be evaluated not just by its ability to provide decision makers with information, but also within the context of broader social, economic, political, and cultural paradigms and expectations (Morgan 2012).

There remains no real consensus in the literature on whether EA always results in better decisions with regards to environmental protection and sustainability. Examples of both effective and ineffective EA processes appear to be project specific and not linked necessarily to one country or regulatory system (Leknes 2000; Pope et al. 2013). So, while there is increasing pressure on EA to be an efficient process that results in timely and less costly (for the proponent and government) decisions (Bond et al. 2014; Morgan 2012), it is also expected to encompass an ever-widening range of topics from health, aboriginal rights, biodiversity, and climate change (Pope et al. 2013). How the inclusion of these other topics impacts the practice of EA and what value they may add, has yet to be discerned, but some scholars question whether it is necessary to have the multitude of often overlapping fields of practice in EA (Pope et al. 2013). Since Garner and O'Riordan (1982) first proposed the four core benefits of EA (consistency and fairness of decisions, early warning for impacts leading to more effective planning, development in a sustainable manner, and public involvement in EA), subsequent work has shown that not all of these benefits are realized in practice, and indeed some of them may not be even realistic or necessary (Bond et al. 2014). Examining what benefits are achievable and desirable is an important step in advancing the theory and practice of EA and in understanding if and how project level EA should be involved in the assessment and management of climate change.

2.4 Addressing Climate Change in EA

Many aspects of industrial development projects are vulnerable to the effects of climate change. Direct impacts include risk to infrastructure in a coastal setting from sea level rise and storm surges, and risk from increased extreme weather in all areas (Hambly et al. 2012; Hunt & Watkiss 2012; Jiricka et al. 2016). The indirect effects of climate change may include impacts to tourism, biodiversity, cultural heritage, air pollution, and economic production (Hunt & Watkiss 2012). Other indirect effects from climate change that may indirectly impact or inform a project's EA analysis are changes to hydrological regimes; species distribution, range and migration; changes in habitat conditions; and altered temperature and precipitation. Because climate change impacts the baseline environment, project EA analysis and mitigation measures can be further affected by changing environmental conditions that may not follow historic norms and trends (Jiricka et al. 2016). Considering climate change in EA will likely result in EAs that are "…more complex than today because many phases of the planning process require an adjustment because of climate change knowledge…" (Jiricka et al. 2016, p. 80-81).

There has been a growing emphasis on using existing EA processes to address climate change effects associated with resource and industrial development projects. As far back as 1997, the United States' Council on Environmental Quality (CEQ) acknowledged that the NEPA assessment process was suited to examine issues related to climate change (Brill 2014). In 2014, the CEQ issued draft guidance on how to consider climate change in assessment; however, these guidelines have yet to be adopted (Gray 2015). Numerous other countries around the world have also provided guidance, regulation, or legislation in relation to addressing climate change in EA. For example, Korea has practiced some form of EA since 1999, with specific GHG assessment guidelines issued in 2009 (Yi & Hacking 2011); the European Union Commission issued specific guidance in 2013 on addressing climate change in EA (Larsen 20124); and guidance is also available from Western Australia (Enriquez-de-Salomena et al. 2016). Both the Canadian federal government and the BC provincial government provide guidance for EA practitioners on how to address climate change in EA practice and decision making (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003; Environmental Assessment Office 2013; CEAA 2014b).

The need to incorporate climate change into EA practices is widely cited in the scholarly literature (Burdge 2008; Byer & Yeomans 2007; Sok et al. 2011; Agrawala et al. 2012; Ohsawa & Duinker 2014; Slotterback 2011; Yi & Hacking 2011), and reference to climate change in EA research has grown substantially over the past twenty years (Li & Zhao 2015). As pointed out by Vale (2016), as global initiatives to address climate change are consistently stalled, a 'bottom-up' approach to climate action within jurisdictions is beginning to dominate and create a patchwork of legislation and policy that has the potential to feed into higher level planning.

Although the academic literature supports greater inclusion of climate change in EA, Agrawala et al. (2012), Byer and Yeomans (2007), Lee (2001) and Jiricka et al. (2016) highlight some of the challenges in doing so. The focus of the literature has been primarily on implementation challenges, such as data gaps, terminology confusion (Watkin & Durning 2012), economic impacts (Babiker & Eckaus 2007), data availability (Jiricka et al. 2016), and uncertainty (Byer & Yeomans 2007; Jiricka et al. 2016). In short, the literature identifies how to improve the baseline and operational information related to climate change and EA science in an attempt to arrive at better EA in practice. However, as pointed out by Cashmore (2004, p.418), because of the multitude of other factors in the decision making process, including "…behavioural, cognitive, informational, and political constraints…", it cannot be assumed that science, or EA, alone will lead to improved processes or decision making (Jay et al. 2007; Leknes 2000). Minimal work has been done to identify what effects the consideration of climate change has on the overall effectiveness of the EA process from the perspective of the different parties involved, or possible impacts to energy security, industry, and the public. If, as Salomons and Hoberg (2014) argue, effective EA processes must consider all the values and perspective of those potentially impacted, including indirect effects, then the issue of setting appropriate boundaries of assessment, as identified by Yi And Hacking (2011), become even more of a challenge in relation to climate change.

The inclusion of climate change in EA will likely generate many challenges for both governments and EA practitioners (Morgan 2012). Making direct connections between project activities and climate change can be difficult given the global scale of climate change and the local scale of project assessment (Brill 2014; Yi & Hacking 2011). Indeed, many of the current

challenges to EA discussed in the literature may be confounded by climate change considerations, including cumulative effects assessments, significance determinations (Ehrlich & Ross 2014; Jones & Morrison-Saunders 2016), mitigation and compensation (Barker & Wood 1999; Joseph et al. 2015), review timelines (Joseph et al. 2015), and assessment methods (Barker & Wood 1999; Brill 2014; Joseph et al. 2015). Some researchers have suggested that SEA may be more effective at considering climate change-related impacts (Enriquez-de-Salmoneca et al. 2016), because it can evaluate potential effects earlier and at a higher level in policy and planning processes (Barker & Wood 1999) - although examples from practice are limited. The Organization for Economic Co-operation and Development (OECD) and the Scottish government, for example, have issued specific guidance on how SEA can be used to address climate change (Byer et al. 2012); and in Germany and China climate change considerations are often addressed in SEA more so than in project EA (Enriquez-de-Salmoneca et al. 2016).

2.5 Research Gaps

While the literature calls for increased climate considerations in EA, there has been little to no critical review of what the effects of doing so are on the EA process itself. Implications for the effectiveness, including efficiency and timeliness, of the EA process as well as for the industries subject to EA have not been identified. The variety of theories on the purpose of EA further complicate the debate and highlight that effectiveness evaluation can be highly subjective and based on socio-economic, cultural, and political contexts (Morgan 2012). When considering climate change in EA, the view of the role of EA is paramount in determining if, and then how, EA should address climate change. At the project level, climate change adds to the challenges in making significance determinations that link to existing policy and legislation, as well as mitigation efforts. Considering recent efforts towards streamlining of the EA process in Canada, and world-wide (Gibson 2012), it is also important to consider implications to factors such as time requirements, cost, and feasibility in conducting EA.

Chapter 3 Research Methods

This research focuses on BC's natural gas sector, specifically LNG infrastructure projects. Canada is estimated to contain 700 to 1,300 trillion cubic feet of natural gas (Aguilera & Aguilera 2012), and BC has some of the largest shale gas deposits in the world. For example, the Laird Basin in northeast BC is reported to have enough gas reserves to fuel Canada's 2014 energy needs for 68 years (NEB 2016). In a 2012 revenue report prepared for the BC Ministry of Energy, Mines, and Natural Gas, it was forecasted that annual revenue to the province from natural gas for the years 2013 to 2037 could be between $79 and $162 million - a significant contribution to the province's coffers (Ernest & Young 2013). Global demand for natural gas is also projected to grow, from 16% to 21% of the total primary energy supply worldwide by 2018 (IEA 2014).

Interest in developing BC's LNG industry significantly increased in the year 2000 as gas prices rose worldwide. The extraction, production, and transportation of LNG is different from that of natural gas with regards to climate change, in that LNG requires greater amounts of energy for the liquefaction process, which is often associated with increased GHG emissions. Natural gas impurities, frequently CO_2, must be separated out, and the level of impurity impacts the amount of GHG emissions released during the purification process. The LNG sector is also characterized by a different geographic scale of concern than natural gas regarding climate change as the liquefaction process is specifically for the transportation of gas, most often to international markets (Murillo 2012).

Recent advancements in extraction technologies for non-conventional gas deposits in shale reserves have opened-up new areas for natural gas exploration, especially in western Canada. The Council of Canadian Academics (2014) reports that BC's natural gas industry is poised to become the largest in Canada and will open new export markets to Asia. Given the recent, rapid growth of BC's natural gas sector (Natural Resources Canada 2015), as well as the province's relatively comprehensive EA process that provides specific consideration to climate change (Ohsawa & Duinker 2015), the sector and the region is well suited for the overall thesis research

question: What are the implications of increased climate change considerations for EA processes and decisions; and what are the implications for improved climate change impact management?

3.1. Environmental Assessment and LNG Regulatory Context

Some form of project review has been in place in Canada since 1973. Federal EA was formalized in Canada in 1995, under the *Canadian Environmental Assessment Act*. The act was replaced in 2012, with the *Canadian Environmental Assessment Act, 2012* (*CEAA* 2012), as part of an omnibus federal budget bill, to 'modernize' the Canadian regulatory system and to allow for assessments to be conducted in a more 'timely' manner (CEAA 2014a). In general, the introduction of *CEAA 2012* resulted in fewer designated projects for federal EA, eliminating most screening or small-project assessments (Doelle 2012); reduced the number of federal decision makers in EA from almost any government department or agency to only three – the Canadian Environmental Assessment Agency, Canadian Nuclear Safety Commission, and National Energy Board; introduced new provisions for greater fines for non-compliance with EA conditions; designated a specific timeline for government processing of EA applications and decision making; and provided for a substituted provincial EA process (CEAA 2014a). The EA process in BC is legislated under the *Environmental Assessment Act*; however, a *Canada-British Columbia Agreement on Environmental Assessment Cooperation,* and a *Memorandum of Understanding on the Substitution of Environmental Assessments*, provides for the option of streamlining of project proposals through a single and coordinated EA process when both a federal and provincial review process is triggered (Sawicka et al. 2016). In June of 2016 the federal government started a review of environmental and regulatory processes, including the federal EA process. A four-person federal review panel was established in August 2016 to examine EA practice in Canada. The panel undertook stakeholder engagement across Canada and delivered their report in August of 2017 (Government of Canada 2017a). One of the areas explored by the panel was climate change and impact assessment with recommendations to provide a consistent approach to how climate change is assessed and modelled and for strategic impact assessment to address implementation of federal strategies to address climate change (Gélinas et al. 2017).

Energy projects in Canada are regulated under a combination of federal and provincial or territorial legislation and regulation. The federal Regulations Designating Physical Activities under the *CEAA 2012* contains specific thresholds for what types of energy developments fall under federal responsibility and, thus, are subject to federal EA (Government of Canada 2012). In general, offshore or inter-provincial and international pipelines and transmission line projects fall under the federal mandate of the National Energy Board (NEB); projects related to nuclear energy fall under the mandate of the Canadian Nuclear Safety Commission; and other energy developments of sufficient size thresholds, or triggering other relevant federal legislation (e.g. *Migratory Birds Convention Act*), are under the mandate of the Canadian Environmental Assessment Agency.

In BC, the Reviewable Projects Regulation under the provincial *Environmental Assessment Act* specifies the EA thresholds for electricity generation projects; natural gas processing plants; pipelines; as well as criteria for water withdrawal, shoreline modification, and marine port facilities amongst others, that may trigger a review of a project (*Environmental Assessment Ac*t Reviewable Projects Regulation 2002). With the introduction of *CEAA 2012*, some natural gas related projects that would previously have been subject to federal assessment now fall under provincial EA jurisdiction only. However, any project proposing to export natural gas requires a permit from the NEB (NRCan 2015), and thus federal approval. When both a federal and a provincial EA review are triggered, the BC government has indicated its desire to use the *CEAA 2012* substitution process wherever possible - with a vision for EA in BC of "one project, one process" (BC Environmental Assessment Office n.d.).

In the case of the BC's energy sector, all oil and gas activities are regulated under the BC Oil and Gas Commission (OGC), including small projects or exploratory works that do not trigger the EA process (BC Oil and Gas Commission [OGC] n.d.; NEB et al. 2016). The BC OGC is a crown corporation, established under the *Oil and Gas Activities Act*, and seeks to be a "one-stop regulatory agency" for oil and gas activities in the province (BC OGC n.d.). In any of the above regulatory scenarios, however, the overall intent of EA in the energy sector in Canada remains the same; to identify potential effects and the means to avoid, mitigate, or compensate for potentially adverse effects, including climate related impacts.

External to EA, there are other regulatory and policy instruments that govern GHG emissions and climate related impacts from energy development in Canada and, in particular, BC (**Table 3.1**). For example, GHG emissions reduction targets are legislated in BC under the *Greenhouse Gas Reductions Targets Act* (Act). The Act sets out a 33% emissions reduction target from 2007 levels by 2020, and an 80% reduction by 2050. The Act also requires emissions reporting every two years by the provincial government in order to track and monitor progress towards these goals. The previous BC Ministry of Natural Gas Development (now the Ministry of Energy, Mines, and Petroleum Resources) which was committed to creating an LNG export industry in BC, had also committed to implementing LNG intensity targets for production facilities and working with BC Hydro to ensure electricity is available to fuel LNG investments and meet this production emissions intensity target. Other climate change related commitments from the Ministry of Natural Gas Development Service Plan for 2016-2019 include developing a Carbon Capture and Sequestration (CCS) regulatory framework that promotes use of CCS technology for LNG projects, developing a 'clean infrastructures credit program', and working to implement BC's Climate Leadership Plan (Ministry of Natural Gas Development and Minister Responsible for Housing 2016).

3.2 Data Collection and Analysis

This research was conducted in two phases. Phase one consisted of a document analysis of all LNG projects that have undergone, or are currently undergoing, a provincial review through the BC's Environmental Assessment Office (EAO). Key documents that are produced during the EA process, such as the Project Description, Applicant Information Requirements (AIR), Application, Environmental Assessment Report and the Environmental Assessment Certificate (EAC), were reviewed to identify whether and how climate change is considered in the public EA review process. Phase two consisted of an in-depth analysis of EA practice in the LNG sector based on semi-structured interviews with EA and LNG industry stakeholders. Using both primary and secondary information sources allowed for a rich, nuanced understanding of climate change considerations in EA practice.

Table 3-1. Relevant BC Provincial and Canadian Federal legislation, regulation and agreements related to LNG EA and /or climate change mitigation or adaptation.

Name	Summary	Date Enacted
Provincial Legislation		
Environmental Assessment Act	Provides the requirements and obligations for the EA process in BC.	May 2002
Carbon Tax Act	Places a price on carbon emissions in the province.	July 2008
Greenhouse Gas Industrial Reporting and Control Act	Sets a greenhouse gas (GHG) emissions benchmark for LNG facilities. The Schedule also includes an emission benchmark for coal based electricity generation.	January 2016
Greenhouse Gas Reduction Targets Act	Sets out reduction targets of at least 33 % below 2007 levels by 2020 and 80% below by 2050. Interim reduction targets of six per cent by 2012 and 18 per cent by 2016.	January 2008
Liquefied Natural Gas Project Agreements Act	Provides the legislative authority for government to enter into and ratify LNG Project Agreements.	July 2015
Oil and Gas Activities Act	Sets out requirements for permits and environmental and management requirements for oil and gas activities.	Last updated April 2014
Liquefied Natural Gas Income Tax Act	Governs the tax rules for the LNG industry in B.C.	January 2017
Environmental Management Act	May require a permit for LNG air emissions.	October 2003
Provincial Regulation		
Reviewable Projects Regulation	Designates threshold for review of major projects.	December 2003
Oil and Gas Activities Act General Regulations	Regulates permits permit expiration, special projects, release of information, surveys, taxation.	September 2010
GHG Emission Reporting Regulation	Sets out GHG reporting and verification requirements for large emitters. Sets out the LNG emissions reporting and information requirements to establish benchmark emissions targets.	January 2016
GHG Emission Control Regulation	Establishes controls for developing emissions offsets and the BC Carbon Registry.	January 2016
Liquefied Natural Gas Facility Regulation	Provides specific requirements for permitting, construction, operation, of LNG facilities.	July 2014
GHG Emission Administrative Penalties and Appeals Regulation	Reward facilities that invest in cleaner technology with an escalating incentive,	January 2016
GHG Emission Administrative Penalties and Appeals Regulation	Establishes the process and penalties for addressing contraventions to the Act.	January 2016
Federal Legislation		
Canadian Environmental Assessment Act	Provides requirements for project review in areas specific to federal authority.	July 2012
Canadian Environmental Protection Act	Waste discharge requirements.	September 1999
Intergovernmental Agreements		
Memorandum of Understanding on the Substitution of Environmental Assessments	Clarifies the roles and responsibilities of regulators to avoid duplication.	2013
Canada-British Columbia Agreement on Environmental Assessment Cooperation	Facilitates a single review process when both provincial and federal EAs are required.	2004

Sources: BC EAO (2016); Government of BC (2016); Sawicka et al. (2016); BC OGC (2016).

3.2.1 Phase one

To understand how climate change is considered in EA practice in BC's natural gas sector, a document analysis was conducted of EAs filed over the last decade. The goal was to assess:

- if climate change and/or greenhouse gas emissions were considered in the EA;
- how climate change issues were identified, considered, and/or evaluated;
- where in the EA process (i.e. at what stage of assessment) climate change issues were considered; and
- what the results, decisions, or outcomes were with respect to any identified climate change issues.

3.2.1.1 Sampling of LNG projects

A coarse filter was applied for selecting projects for inclusion in the review, namely that the project was: i) a LNG related project (e.g. pipelines or processing facilities); ii) occurred wholly within the provincial borders of BC; iii) was subject to EA by the BC provincial government; and iv) and commenced within the last two decades (i.e. start date of EA that was January 2004, or later). The LNG industry is a relatively new industry in BC. Further, although natural gas project EAs existed prior to 2004, natural gas and LNG projects differ regarding climate change issues and thus the EA documentation, particularly regarding climate change considerations, may not be directly comparable.

Projects that were reviewed and then determined by the BC EAO not to require an EAC were removed from the project list. Natural gas projects not specifically related to the LNG export industry, such as co-generation facilities, storage facilities, pipelines not terminating at proposed LNG facilities, or processing facilities for domestic transport, also were not included. Projects that were submitted for EA review and then withdrawn, and those still in the EA process at the time of the research, were included in the analysis. This included projects up to December 31, 2015. The final list of projects included in the analysis is shown in **Table 3.2**.

Table 3 2. LNG facilities and pipelines subject to BC EA review and included in the analysis.

Project	Start Date	Phase	Completed
Aurora LNG Digby Island	2014/06/23	Pre-Application	-
Aurora LNG Grassy Point	2014/06/23	Withdrawn	2015/01/08
Cabin Gas Plant Project	2008/12/11	Amendments	2010/01/28
Coastal GasLink Pipeline Project	2012/12/11	Certificate Issued	2014/10/23
Eagle Mountain – Wood fibre Gas Pipeline Project	2013/08/01	Under Review	-
Fortune Creek Gas Project	2011/11/08	Certificate Issued	2013/10/07
Grassy Point LNG	2014/08/08	Pre-Application	-
Kingsvale to Oliver Natural Gas Pipeline Reinforcement	2011/11/10	Withdrawn	2011/11/10
Kitimat LNG Terminal Project	2004/09/14	Certificate Extension	2006/06/01
LNG Canada Export Terminal Project	2013/04/03	Certificate Issued	2015/06/17
Pacific Northern Gas Looping Project	2013/07/24	Pre-Application	-
Pacific NorthWest LNG Project	2013/07/16	Certificate Issued	2014/11/25
Pacific Trail Pipelines Project	2005/11/23	Certificate Extension	2008/06/26
Prince Rupert Gas Transmission Project	2013/06/06	Certificate Issued	2014/11/25
Prince Rupert LNG Project	2013/05/02	Pre-Application	-
WCC LNG Project	2015/01/07	Pre-Application	-
Westcoast Connector Gas Transmission Project	2012/11/09	Certificate Issued	2014/11/25
Woodfibre LNG Project	2013/11/27	Certificate Issued	2015/10/26

Source: BC EAO (2016)

3.2.1.2 EA document analysis

Project documents were obtained from the BC EAO's online Project Information Centre (https://projects.eao.gov.bc.ca). The documents are publicly available and constitute the legal record of the EA process. The documents were downloaded for review in 2015 and all project information, up to December 31, 2015, was included. In the rare case that a posted document was labelled as a 'draft', it was not included because the content could change over the course of the EA. The documents reviewed for each project are shown in **Table 3.3**. For each project, the following documents were selected for analysis, where applicable to the EA filing, capturing each of the three main stages of the BC EA process:

Stage 1. Pre-Application: Project Description; Applicant Information Request; Valued Component Selection Report.

Stage 2. Application Review: Application; Environmental Assessment Report.

Stage 3. Decision: Environmental Assessment Certificate.

Table 3-3. Documents included in the review of provincial LNG EAs.

Project Name	Project Type	Date EA Commenced	Current EA Status	Documents Reviewed					
				PD	AIR	VC Selection	Application	EA Report	EAC
Pacific Trail Pipelines Project	Pipeline	2005/11/23	Certificate Issued 2008/06/26 – Certificate Extensions	Yes	Yes	N/A	Yes	Yes	Yes
Kingsvale to Oliver Natural Gas Pipeline Reinforcement Project	Pipeline	2011/11/10	Withdrawn 2015/12/18	Yes	Yes	N/A	N/A	N/A	N/A
Westcoast Connector Gas Transmission Project	Pipeline	2012/11/09	Certificate Issued 2014/11/25	Yes	Yes	Yes	Yes	Yes	Yes
Coastal GasLink Pipeline Project	Pipeline	2012/12/11	Certificate Issued 2014/10/23	Yes	Yes	Yes	Yes	Yes	Yes
Pacific Northern Gas Looping Project	Pipeline	2013/07/24	Pre-Application	Yes	Yes	Yes	N/A	N/A	N/A
Eagle Mountain – Wood fibre Gas Pipeline Project	Pipeline	2013/08/01	Under Review	Yes	Yes	Yes	Yes	N/A	N/A
Prince Rupert Gas Transmission Project	Pipeline	2013/06/06	Certificate Issued November 25, 2014 - Amendments	Yes	Yes	Yes	Yes	Yes	Yes
Kitimat LNG Terminal Project	Facility	2004/09/14	Certificate Issued 2006/06/06 – Certificate Extension	Yes	Yes	N/A	Yes	Yes	Yes
Cabin Gas Plant Project	Facility	2008/12/11	Certificate Issued 2010/01/28 - Amendments	Yes	Yes	N/A	Yes	Yes	Yes
Fortune Creek Gas Project	Facility	2011/11/08	Certificate issued 2013/10/07	Yes	Yes	N/A	Yes	Yes	Yes
LNG Canada Export Terminal Project	Facility	2013/04/03	Certificate Issued 2015/06/17	Yes	Yes	N/A	Yes	Yes	Yes

Project Name	Project Type	Date EA Commenced	Current EA Status	Documents Reviewed					
				PD	AIR	VC Selection	Application	EA Report	EAC
Prince Rupert LNG Project	Facility	2013/05/02	Pre-Application	Yes	Yes	N/A	N/A	N/A	N/A
Pacific NorthWest LNG Project	Facility	2013/07/16	Certificate Issued 2014/11/25	Yes	Yes	N/A	Yes	Yes	Yes
Woodfibre LNG Project	Facility	2013/11/27	Certificate Issued 2015/10/26	Yes	Yes	Yes	Yes	Yes	Yes
Aurora LNG Digby Island	Facility	2014/06/23	Pre-Application	Yes	Yes	Yes[1]	N/A	N/A	N/A
Aurora LNG Grassy Point	Facility	2014/06/23	Withdrawn 2015/01/08	Yes	N/A	N/A	N/A	N/A	N/A
Grassy Point LNG	Facility	2014/08/08	Pre-Application	Yes	N/A	N/A	N/A	N/A	N/A
WCC LNG Project	Facility	2015/01/07	Pre-Application	Yes	N/A	Yes	N/A	N/A	N/A

[1]The AIR and VC documents were provided in a single document file for the Aurora LNG Digby Island project.

The documents were searched for specific climate change terminology to locate climate change discussions in the EA documents and understand when, where, and how climate change was considered and assessed. The initial selection of climate change terminology to guide the search was based on Watkins and Durning (2012, p. 297), who present a variety of typologies used in EA regarding climate change. After an initial review of Project Descriptions and AIRs, this list was refined based on researcher observations and definitions provided by Environment and Climate Change Canada (2016). **Table 3.4** presents the final list of climate-related search terms used for the document analysis.

Table 3-4. Climate change search terms used in the EA document review.

Carbon	Carbon dioxide (CO_2)	CO_2^e (Co_2e/equivalent/eq)
Greenhouse gas (GHG)	Climate change	Global warming
Nitrous Oxide (N_20)	Methane (CH_4)	Ozone

The documents were searched using the 'find' function in Adobe for .pdf documents. In two instances the .pdf document was not searchable (e.g. it had been locked or was a scan of a document), so the entire document was read manually to locate terms. The following filters were then applied to searched terms located in the document:

- Only when the term was used in the context of climate or climate change was it included in the analysis. Examples of terms located but not addressed in relation to climate change and thus not included in the results are 'coal bed methane', 'hydrocarbons', and 'organic carbon'.
- Ozone was not included when used in reference to air quality.
- Carbon dioxide (CO_2) and methane (CH_4) were not included when used in reference to the processing of the natural gas or the chemical composition of the gas.
- Document section headings containing the search terms were not included in the word count for each term; however, information from these section(s) was reviewed and included when appropriate.
- Words in document reference sections, appendices, and acronym lists were not included in the word count.

Words that met all the above search parameters were then counted within the section of the EA stage, and document, that they occurred. When a word was identified, the section where it occurred in the document was read to understand the context of its use. A summary of context, count of the number of times the word was used, the document type, section, and page number was recorded in an Excel spreadsheet. This information was then synthesized and summarized to identify trends and provide detailed context for the interview results.

3.2.1.3 Phase one sources of potential error

To reduce potential errors or omissions, the following measures were taken:

- A list of searchable words was visible during the entire document search to ensure no terms were missed.
- When no terms were found in the document, searching for a known term, such as 'the' was undertaken to ensure the search function in the document was operational.
- If 'greenhouse gas' was not located in the document 'green house gas' was searched; in one project EA both terms were used throughout the documents.
- Reading the text immediately preceding and after located search terms to ensure all relevant content related to climate change was identified.

Even with implementing measures to reduce potential errors or omissions, there remains a risk of potential error when completing the document review, including: errors in identifying climate change related words while conducting manual reviews of documents, when .pdf versions were not searchable; and missing information related to climate change if other terminology not included in the searchable terms was used in the document.

3.2.2 Phase two

Phase two provided for a more nuanced analysis of how climate change is addressed in EA and the LNG industry through semi-structured interviews with EA and LNG industry stakeholders. Representatives from industry, government, EA practitioners, and non-government organizations (NGOs) were identified as potential interview candidates. These groups are considered integral to the EA process, and to the intersection of EA with climate change and the energy industry for the following reasons:

- Industry representatives initiate and invest in a project and are the proponents responsible for leading their project through the EA process. The also provide the technical analysis of impacts through the EAs, and engage with the public and First Nations.
- Government representatives are responsible for legislative and regulatory oversight of their respective mandates. For the BC EAO this includes overseeing and managing the EA process as well as information provisioning, and issue the AIR, Environmental Assessment Report, and EAC.
- Non-government organizations participate in the EA process, representing potentially impacted parties, and in some cases, provide input to the AIR and comment on the Application.
- EA practitioners carry out the data collection, analysis, and recommendations on behalf of the proponent, but also potentially for government, First Nations, or other stakeholders, and are involved in one or more stages of the EA process.

Initial interview candidate selection was based on participation in active EAs, as identified in Phase one, and through public involvement in the areas of climate change, EA, and / or the LNG industry. Subsequent interview candidates were selected using a modified snowball sampling technique (Dane 1990; Flowerdew & Martin 2005; Gunn & Noble 2011) wherein interviewees were asked to provide names of other potential interview candidates. A total of 22 interview candidates were interviewed between July 2015 and January 2016 (**Table 3.5**). Interviews were conducted via telephone and in person, with one respondent choosing to provide a written response.

Table 3-5. Interview participants, by stakeholder group.

Group	Description	Number of participants
Non-Government Organizations	Includes environmental advocacy and community groups that functioned in the areas of conservation, environmental protection, climate research, and / or energy.	5
Government	BC government employees representing three separate agencies.	3
Industry	Representatives from two major LNG projects as well as an LNG industry consortium were interviewed.	3
Practitioners	Practitioners were those directly involved with EA and may work on behalf of project proponents and / or First Nations.	5
Academia	Academics from Canadian universities who had worked either directly or indirectly in the realms of climate change, environmental assessment and / or consultation	2
Legal	Practicing lawyers working in either the private or not-for-profit sectors in areas related to the research subject areas.	4

3.2.2.1 Interview administration and analysis

Semi-structured interviews were based on five major topic areas, with three to six primary questions under each topic and, where appropriate, secondary questions developed to enhance the responses for the primary questions (Hay 2010). The five topic areas explored in relation to climate change in EA were 'legislation and regulatory requirements', 'guidance documents and regulator direction', 'current practice', 'effects of climate change considerations in EA', and 'towards improved practice'. Questions under each topic were formulated based on stakeholder issues reported in previous EA documents (reviewed in Phase 1); issues identified through previous reports and studies, as summarized in Chapter 2; and based on the experience and knowledge of the researcher to specifically address the research questions.

Interviewees were provided with a general definition of climate change to include both mitigation and adaptation prior to commencing the interview. The interview outline, including the questions and background information provided, are included in Appendix A. Although grounded in a pre-determined set of discussion topics and open-ended questions, the interview process provided for the flexibility to deviate and explore new questions that emerged during interviews (Sarantakos 1994), and to then raise and revisit these new issues in subsequent interviews and analysis through an iterative process (Strauss & Corbin 1990). While an effort was made to ask all interviewees all the questions, due to time constraints or the expressed areas

of knowledge of the subject not all questions were asked to all interviewees. As well, given the flexible nature of the interviews, a response to a question sometimes addressed multiple questions or included information not covered under any of the five thematic areas. Interviews were approximately 40 to 60 minutes in length and were digitally recorded and then transcribed for analysis.

Notes were taken during interview transcription of any major preliminary themes or ideas that emerged under each interview topic. All interview responses were grouped under the individual, pre-determined list of questions. When an answer was not in response to a question in the interview guide, it was either placed under the most appropriate question(s) or into an 'other' theme. Responses for each question were then read and abbreviated, where possible, to identify the key points without losing any content or meaning. All responses for each question were then analyzed and coded based on response type or dominant theme or sub-theme emerging - a process of coding up or open coding to group and regroup interview data until common themes emerged (Glaser &Strauss 1967). Consistent with a grounded theory approach (Amsteus 2014), analysis was not based on pre-existing theories or assumptions, but rather allowed ideas and themes to emerge through an iterative coding and review process (Birks et al. 2014, p.2).

3.2.2.2 Phase two sources of potential error or bias

Potential errors or bias may have occurred during the sampling and the analysis stages. The use of a modified snowball sampling technique to identify survey participants was undertaken to generate a diverse group of stakeholders, values, experiences, and opinions. There is the risk that some groups with divergent values and experiences were missed in the sampling, such that the full breadth of experiences, values and opinions were not fully identified during the analysis. Triangulation of the data by using multiple data sources reduces the risk of this type of validation error (Creswell & Clark 2011). There is also a risk that some potentially meaningful themes were not identified and reported during the interview analysis. The two methods employed to reduce the likelihood of this type of error are the reporting of 'disconfirming evidence', that is data that both in agreement with and contrary to the identified themes, and having the data and analysis reviewed by other research professionals in the field, in this case by the research supervisor Dr. Bram Noble (Creswell & Clark 2011).

3.3 Ethical Considerations

There are no known significant ethical concerns associated with this research. Documents included in this research were obtained from a public government registry and are freely available to the public. Individual interview participants were not the subjects of research as defined under the Tri-Agency policy on ethics for research (Government of Canada, Secretariat on the Responsible Conduct of Research 2014). However, all identifying information regarding the interview participants was kept confidential and known only to the researcher and the supervisor. No personally identifying information was recorded, and participants were identified based only on their professional affiliation. The purpose and goals of this research were communicated to the participants (see Appendix A), and their consent obtained for both the interview and the recording of the interviews, prior to starting the interview process.

Chapter 4 Results

This chapter presents the results of the document analysis followed by the results of the semi-structured interviews. The document analysis examined key documents provided during the environmental assessment of 18 LNG facility and pipeline projects. The semi-structured interview results incorporated representatives from key stakeholder groups. The results of both the document analysis and semi-structured interviews were tabulated and are presented in table form with the results discussed in greater detail in Chapter 5.

4.1 Examination of Key EA Documents for BC LNG Related Projects

Table 4.1a and **4.1b** show the total frequency with which each climate change term appeared in the examined EA documents for pipelines and facilities, respectively. It is important to note that not all EAs had the same number of documents available, due to being at different stages in the EA process or from having been withdrawn from the EA process. As well, frequency of occurrence of climate change-related terms in EA documentation does not speak to the nature or the quality of the assessment with regards to climate change; though, it is reasonable to correlate frequency of use for a term with the relative attention that the topic received.

While comparisons between individual EA's cannot be made, it is of note the greater frequency with which climate change terminology appears in EAs for facility projects than for pipeline projects. In general, the direct emission from facilities are larger than that of pipelines due to the energy requirements for the cooling processes to produce liquid natural gas, potentially a reason why climate change receives greater attention in EAs for these projects. However, as noted in the interview results, if up and down stream emissions for pipeline projects were considered, their GHG emissions could be significant.

Table 4-1a. Frequency of climate change terminology appearing in BC LNG EA documents from 2005 to 2015 – pipeline projects.

Project Name (Pipelines)	Year	Climate Change Terms								Sub-Total	% of total (2,212)
		Carbon	Carbon Dioxide	Green-house Gas	Climate Change	Global Warming	Nitrous Oxide	Methane	Ozone		
Pacific Trail Pipelines Project	2005	0	9[1]	78	18	2	0	0	1	**108**	4.9%
Kingsvale to Oliver Natural Gas Pipeline Project	2011	0	0	0	7	0	0	0	0	**7**	0.3%
Westcoast Connector Gas Transmission Project	2012	53	47	216	64	5	11	20	0	**416**	18.8%
Coastal GasLink Pipeline Project	2012	29	57	301	31	6	14	17	0	**455**	20.6%
Pacific Northern Gas Looping Project	2013	0	7	27	3	0	8	8	0	**53**	2.4%
Eagle Mountain – Woodfibre Gas Pipeline Project	2013	47	63	471	106	2	30	70	0	**789**	35.6%
Prince Rupert Gas Transmission Project	2013	15	33	287	33	0	9	8	1	**386**	17.4%
Sub-Total		**144**	**216**	**1380**	**262**	**15**	**72**	**123**	**2**	**2,214**	
% of total (2212)		6.5%	9.8%	62.3%	11.8%	0.7%	3.3%	5.6%	0.1%		

[1]In the EA Report it was reported as 'carbon monoxide' but given the context of use this was likely a typo and the intended term was 'carbon dioxide'.

Table 4-1b. Frequency of climate change terminology appearing in BC LNG EA documents from 2005 to 2015 – facility projects.

Project Name (Facilities)	Year	Climate Change Terms								Sub-Total	% of total (4,349)
		Carbon	Carbon Dioxide	Green-house Gas	Climate Change	Global Warming	Nitrous Oxide	Methane	Ozone		
Kitimat LNG Terminal Project	2004	0	86	181	41	9	7	40	0	**364**	8.4%
Cabin Gas Plant Project	2008	150	129	65	7	1	0	2	0	**354**	8.1%
Fortune Creek Gas Project	2011	104	188	462	33	7	14	20	3	**831**	19.1%
LNG Canada Export Terminal Project	2013	39	141	594	59	5	23	31	2	**894**	20.6%
Prince Rupert LNG Project	2013	2	10	50	13	0	7	7	2	**91**	2.1%
Pacific NorthWest LNG Project	2013	56	144	399	35	6	18	29	3	**690**	15.9%
Woodfibre LNG Project	2013	19	70	521	182	7	16	24	3	**842**	19.4%
Aurora LNG Digby Island	2014	1	12	65	6	0	6	7	0	**97**	2.2%
Aurora LNG Grassy Point	2014	2	18	30	4	0	10	14	0	**78**	1.8%
Grassy Point LNG	2014	5	9	20	1	0	2	6	0	**43**	1.0%
WCC LNG Project	2015	0	16	37	8	0	1	1	2	**65**	1.5%
Sub- Total		**378**	**823**	**2424**	**389**	**35**	**104**	**181**	**15**	**4,349**	
% of total (4349)		8.7%	18.9%	55.7%	9.0%	0.8%	2.4%	4.2%	0.4%		

The frequency each climate change term was identified across all EA document types is shown in **Table 4.2**. Due to the differences in the number of documents available for each EA, comparisons between documents were not made; however, the Application is clearly where most climate change discussion occurred. While certain terms were used with greater frequency than others, such as greenhouse gas / GHG and carbon dioxide / CO_2, other less frequently used terms, such as carbon and methane, provide insight into how the project EA considered climate change related topics. For example, searches for methane may explain if, and how, the project is addressing fugitive emissions, a topic of concern that emerged repeatedly during the research interviews. The most commonly used climate change related term was greenhouse gas, appearing as both 'greenhouse gas' and 'GHG'. This term was overwhelmingly the most commonly used term in both LNG pipeline and facility EAs, at 62.3% and 55.7% frequency, respectively. GHGs are considered an intermediary component, or a measurable indictor, for climate change that can be directly attributed to the project. But GHGs are generally not correlated to climate change impacts, which are notoriously hard to isolate at a project level scale from other environmental impacts, and as such are generally discussed in the assessments in terms of mitigation, or reducing emissions. Numerous interview respondents, including those from government agencies and practitioners, also indicated that the focus of climate change in EA is most often on mitigation.

The Project Description is the document submitted by the proponent at the beginning of a EA to the EAO, and is often the first project document submitted in the EA process. It describes the project and provides the information required for the EAO to determine if the project is considered reviewable under the Reviewable Projects Regulations. It also serves as the initial step in communicating to the public and First Nations about the project and in selecting the valued components to be assessed in the subsequent phases of the EA (BC EAO, April 2016). All ten of the project descriptions for LNG facilities examined referenced one or more climate change terms; however, only three of the eight project descriptions for pipelines referenced climate change terminology. There does not appear to be a temporal correlation as to whether a Project Description referenced climate change, with both older and more recent projects excluding climate change terminology. This discrepancy may be due to the larger direct emission generated from facilities than from pipelines; however, as discussed during the interviews,

project level EA often fails to account for fugitive, indirect, and induced emissions for which pipelines would potentially contribute as much, if not more, than facilities.

Table 4-2. Frequency of use of each climate change term, by document type, for all reviewed provincial LNG EA documents.

Terms	Pre-Application Phase			Application Review Phase		Decision Phase
	Project Description (n=18)	*Applicant Information Requirements* (n=15)	*VC Selection* (n=7)	*Application* (n=11)	*Environmental Assessment Report* (n=10)	*EAC* (n=10)
Carbon	14	18	1	335	156	3
Carbon dioxide	51	69	19	676	222	2
Greenhouse gas	133	386	47	2,530	666	36
Climate change	16	58	16	463	98	0
Global warming	1	0	0	36	13	0
Nitrous Oxide	20	41	8	89	23	0
Methane	27	39	8	188	40	0
Ozone	4	1	0	9	3	0
Total	**266**	**612**	**99**	**4,326**	**1,221**	**41**

While not all Project Descriptions for pipeline projects referenced climate change terminology (**Table 4.3**), all subsequent documents reviewed had reference to one or more climate change terms. For example, the AIR, the document submitted by the EAO which describes the information that must be submitted by the proponent in their applicant for an EAC, always included climate change terminology for both pipeline and facility LNG projects. The AIR forms the basis for the information submitted and assessed during an EA and is often the primary source of guidance to proponents and practitioners during an EA. Additionally, all subsequent documents submitted as part of the EA for LNG pipelines, up to and including the EAC when available, included some reference to climate change; with the exception of the EAC for the Woodfibre LNG facility project. Interestingly, climate change terminology appeared throughout the EA for the Woodfibre project, and during the interviews Woodfibre was used as an example of a LNG project with minimal GHG production. As the EAC is intended to create legally enforceable mitigation to address issues raised during the EA (EAO 2016), it is possible that the lack of reference to climate change terminology in the EAC for Woodfibre is due to issues with

respect to climate change being adequately addressed through the EA process, therefore not necessitating the need for conditions specific to climate change.

Results show that climate change indicator terms, including greenhouse gas and carbon dioxide, appeared in project EACs, forming part of the project's requirements for all but one project, the aforementioned Woodfibre LNG facility (**Table 4.3**). The EAC is a legally binding document that all reviewable project in BC require prior to proceeding with permitting and construction. The Certificate may condition project specific conditions that create further requirements in addition to those set out in legislation and regulation. The AIRs for both facilities and pipelines referred to climate change (**Table 4.3**), predominantly to carbon and GHGs (**Table 4.2**).

In addition to the AIR, there is frequently a valued component (VC) selection document prepared that outlines what VCs are selected for the EA, why they were selected, and what indicators will be used to measure the VC. In 2013, the EAO issued guidelines for selecting and evaluating VCs during provincial EAs (Environmental Assessment Office 2013b). Approximately half of the relevant EAs examined had an accompanying VC selection document (seven EAs did not have a separate VC selection document, eight EAs did have one, and three were not relevant because they were not at that stage of EA). Of the seven that did not have a separate VC selection document, five commenced prior to 2013. Of the eight VC selection documents, all but one (Coastal Gaslink project) referenced climate change terminology (**Table 4.3**).

Climate change references in EA documents seems to indicate that, at least on the surface, climate change is being incorporated into EAs for the LNG sector in BC. How this assessment occurs and the value it provides is not explicit from the document analysis, but can be elucidated when looking at the documents in conjunction with the interviews conducted with stakeholders.

Table 4-3. Reference to climate change terminology, by project type (pipeline, facilities) and by document type.

Project Name	Project Type	Date EA Commenced	Current EA Status	Reference made to at least one climate change term					
				PD	AIR	VC Selection	Application	EA Report	EAC
Pacific Trail Pipelines Project	Pipeline	2005/11/23	Certificate issued 2008/06/26 –Extensions	No	Yes	N/A	Yes	Yes	Yes
Kingsvale to Oliver Natural Gas Pipeline Reinforcement	Pipeline	2011/11/10	Withdrawn 2015/12/18	No	Yes	N/A	N/A	N/A	N/A
Westcoast Connector Gas Transmission Project	Pipeline	2012/11/09	Certificate issued 2014/11/25	Yes	Yes	Yes	Yes	Yes	Yes
Coastal GasLink Pipeline Project	Pipeline	2012/12/11	Certificate Issued 2014/10/23	Yes	Yes	No	Yes	Yes	Yes
Pacific Northern Gas Looping Project	Pipeline	2013/07/24	Pre-Application	No	Yes	Yes	N/A	N/A	N/A
Eagle Mountain – Wood fibre Gas Pipeline Project	Pipeline	2013/08/01	Under review	No	Yes	Yes	Yes	N/A	N/A
Prince Rupert Gas Transmission Project	Pipeline	2013/06/06	Certificate issued November 25, 2014 - Amendment	Yes	Yes	Yes	Yes	Yes	Yes
Kitimat LNG Terminal Project	Facility	2004/09/14	Certificate issued 2006/06/06 – Extension	No	Yes	N/A	Yes	Yes	Yes
Cabin Gas Plant Project	Facility	2008/12/11	Certificate Issued 2010/01/28 - Amendments	Yes	Yes	N/A	Yes	Yes	Yes
Fortune Creek Gas Project	Facility	2011/11/08	Certificate issued 2013/10/07	Yes	Yes	N/A	Yes	Yes	Yes
LNG Canada Export Terminal Project	Facility	2013/04/03	Certificate issued 2015/06/17	Yes	Yes	N/A	Yes	Yes	Yes
Prince Rupert LNG Project	Facility	2013/05/02	Pre-Application	Yes	Yes	N/A	N/A	N/A	N/A
Pacific NorthWest LNG Project	Facility	2013/07/16	Certificate issued 2014/11/25	Yes	Yes	N/A	Yes	Yes	Yes
Woodfibre LNG Project	Facility	2013/11/27	Certificate issued 2015/10/26	Yes	Yes	Yes	Yes	Yes	No
Aurora LNG Digby Island	Facility	2014/06/23	Pre-Application	Yes	Yes	Yes[1]	N/A	N/A	N/A
Aurora LNG Grassy Point	Facility	2014/06/23	Withdrawn 2015/01/08	Yes	N/A	N/A	N/A	N/A	N/A
Grassy Point LNG	Facility	2014/08/08	Pre-Application	Yes	N/A	N/A	N/A	N/A	N/A
WCC LNG Project	Facility	2015/01/07	Pre-Application	Yes	N/A	Yes	N/A	N/A	N/A

[1]The AIR and VC documents were provided in a single document file for the Aurora LNG Digby Island LNG project.

4.2 Perceived Benefits and Implications of Current and Increased Climate Change Considerations in EA

Interview results are presented below, organized under each of the five main topics explored. These include: legislation and regulatory requirements, guidance documents and regulator direction, current practice, effects of climate change considerations in EA, and improved practice.

4.2.1 Legislation and regulatory requirements

Participants were asked about the adequacy of current legislative and regulatory requirements for addressing climate change in EA in BC's LNG industry. The majority indicated that current legislation and regulations are inadequate to ensure that climate change is adequately considered in EA (**Table 4.4**). Some respondents, including a practitioner, felt this because the legislation itself was inadequate, stating "…provincially the requirements are quite weak…". Other respondents indicated that the inadequacy of current legislation was due to the lack of linkages between the legislation and the EA, with one representative of legal EA practice stating "…in terms of the environmental assessment process it's [climate change] not directly taken into account…", while another representative from an NGO felt that current EA practice "…can lead to the approval of projects that kind of directly contravene BCs targets".

Table 4-4. Summary of responses for interview questions examining current legislation and regulatory requirements related to climate change and environmental assessment.

Questions[1]	Response			
	Yes	No	Other[2]	Sample size (n)
Is current legislative / regulatory requirements for addressing climate change in EA in BC's LNG sector adequate/sufficient?	1 (5%)	13 (62%)	7 (33%)	21
Is there any regulatory uncertainty or ambiguity?	8 (57%)	1 (7%)	5 (36%)	14
Are climate change requirements in EA evenly applied across the LNG industry?	8 (42%)	4 (21%)	7 (37%)	19
Have climate change regulations and / or requirements from the BC Environmental Assessment Office (EAO) changed in recent years?	4 (27%)	4 (27%)	7 (47%)	15

[1]Not all interview respondents provided discrete yes/no answers to questions asked through the interview.
[2]Respondents who were unsure, ambiguous, described the process without offering an opinion, or did not know.

Participants indicated that although current legislation may be inadequate in addressing climate change, it is clear in terms of the requirements that currently exist. More than half of the respondents who noted that there is uncertainty, noted that it is rooted in potential future changes in regulation and legislation but that the current legislation and/or AIR requirements are clear. As a NGO representative pointed out "…we're committing ourselves to an industry that has a lifetime of thirty years as a minimum..." while at the same time there are changing requirements related to climate change, including recent new legislation regarding LNG intensity targets. Respondents noted this uncertainty in whether a current LNG industry would be aligned with future regulatory requirements with respect to climate change and GHG emissions.

It was acknowledged by many respondents that BC has GHG reduction targets in place but lacks clear direction on how to achieve those targets. Generally, respondents expected there to be policies implemented by regulators to help meet these targets, but were unclear what those policies may look like in application and how they may impact existing industrial GHG emitters. For example, it was pointed out by some respondents, including representatives from government, NGOs, practitioners, and academia, that while the AIRs are established at a single point in time for the duration of an EA, policy and legislation can change during an EA creating a 'moving goalpost'. This creates challenges both in terms of effectively implementing and enforcing new regulations, as well as in creating certainty for industry seeking to make large investments in major projects.

Approximately a third of respondents were not familiar enough with the different proposed LNG projects in the provincial EA process to provide a response regarding whether EA is evenly applied across different types of LNG projects (i.e. pipeline versus processing facilities), or across different sectors (e.g. LNG versus mining or hydro). Of the eight respondents who clearly identified that EA requirements are evenly applied, two practitioners stated thusly only because they felt these requirements were 'equally ignored' by regulators in the EA process. Four respondents, including participants from NGOs, legal, practitioners, and academia, felt that requirements are not evenly applied to all projects undergoing a BC EA. Several respondents stated that the reason for the unequal application was often because the EA does not consider the

whole supply chain of a project, but rather examines just a single step in the lifecycle of LNG extraction, transport, production, and marketing.

Because EA for LNG projects examines a single point in the lifecycle production of LNG, participants indicated that this resulted in the EA missing the true cumulative effects of LNG projects. One point that was brought to bear by a representative of an NGO was that different projects trigger different federal and/or provincial reviews depending on their size and location. As well, respondents noted that while the regulations may be equally applied, the project development agreements (PDA)[1] between the provincial government and project proponents may cause there to be differences in application for individual projects and that there is some discretion in how requirements are applied to individual projects. Exactly how the PDAs may influence climate change considerations is not explicitly known, but it was suggested that more favourable economic considerations for LNG projects may reduce the market incentive to move to technologies and methods that limit greenhouse gas production in the face of potential future increases in the carbon tax. However, results of the document analysis (**Table 4.3**) show that of the 18 projects examined all made at least some mention of climate change.

Participants were equally divided between 'yes' and 'no' with respect to whether EA requirements from the BC EAO have evolved and changed in recent years, and with approximately half unsure if requirements had changed. Generally, there was agreement that there has been little to no change in the guidance from government regulators with respect to how climate change should be considered in EA; however, there may have been changes in EA practice due to public pressure. One academic provided the example of the TransMountain Expansion Project (an NEB regulated oil pipeline) that was taken to court because of GHG impacts, to illustrate the effect that public pressure may have on a project.

Several challenges to the current regulatory environment for climate change in EA in BC were also identified by respondents. Numerous respondents highlighted the potential for regulatory requirements at both the provincial and federal level to change in the future, thus creating

[1] PDAs are enabled by the *Liquified Natural Gas Project Agreements Act* passed in 2015 and available at http://www.bclaws.ca/civix/document/id/complete/statreg/00_14034_01_cm

uncertainty in climate change requirements for projects. For example, one NGO representative commented that it is unknown what future GHG emissions reduction strategies could mean for current industries with a proposed life span of several decades and "…if future governments put in policies to meet those [GHG emission reduction] targets how can the project adapt to those requirements".

Other challenges identified include the timelines for review and comment. The BC *Environmental Assessment Act* has a legislated timeline of 180 days for the review of the Application and preparation and submission of the Environment Assessment Report to the Ministers for decision. These legislated timelines allow for certainty in the process for proponents, but can also hinder smaller organizations and individuals from addressing the numerous issues, including climate change, that are examined in a project Application. As stated by an EA practitioner, "…everybody in the EA room is overwhelmed with project review when you have these legislated timelines that are so inflexible…". Another respondent from an NGO recognized the challenge of completing EA reviews, but went on to note that "…reviewing those documents, and they're quite detailed, as they should be, it's a time-consuming task but I don't really know any other way you could do it so…it doesn't seem to be a fault of the process as much as just a reality of the level of detail you need to get into". One respondent from legal noted that with respect to the timelines provided for review for EA, "…they're pretty complex projects and I think they're having to deal with a lot of complex information in a very short period of time... [s]o I think that may have an impact on kind of the quality of review".

4.2.2 Guidance documents and regulator direction

Guidance documents and regulator direction refers to both the formal and informal information provided by government, associations (e.g. International Association of Impact Assessment), and academia with respect to environmental assessment and climate change. In the context of BC EA, the primary source of guidance and regulator direction is the BC EAO; however, there is a variety of guidance from other sources, such as other domestic and foreign government agencies and other professional and academic associations, such as the IPCC. Guidance from the EAO often takes the form of the project specific AIR, guidance documents for proponents, or project specific direction from EAO staff. The interview questions for the theme of guidance documents

and regulator direction examined what, if any, guidance is used in assessing climate change in EA, how it is used, and possible gaps or areas for improvement. A summary of responses to interview questions addressing guidance and regulator direction with discrete yes/no answers is provided in **Table 4.5**.

Table 4-5. Summary of responses for interview questions regarding guidance documents and regulator direction.

Questions[1]	Response			
	Yes	No	Other[2]	Sample Size (n)
Is current guidance from the BC EAO for how to consider climate change in EA sufficient?	3 (19%)	8 (50%)	5 (31%)	16
Are you familiar with the 2003 document: *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*?	9 (53%)	8 (47%)	0 (0%)	17
Is the guidance it provides sufficient?	0 (0%)	5 (63%)	3 (38%)	8

[1]Not all interview respondents provided discrete yes/no answers to questions asked through the course of the interview.
[2]Respondents who were unsure, ambiguous, described the process without offering an opinion, or did not know.

Many interview respondents felt that guidance from the EAO on how to consider climate change in EA is not sufficient, including guidance provided to proponents, practitioners, and intervenors in the EA process (**Table 4.5**). The criticisms of the current guidance predominantly related to the inability of EA to address the larger scope and scale of issues related to climate change and its inability to capture the 'bigger picture'. Without the proper tools to guide those involved in EA in navigating these issues, many respondents felt that current practice was not effective in addressing climate change. Because of the lack of guidance and clear thresholds, there is a feeling that there is a large amount of discretion applied on the part of proponents in their assessment of climate change. As pointed out by one academic interviewee "…clear guidance potentially offers is a more transparent and level playing field for stakeholders who are trying to participate in the process". Other respondents noted that current guidance is focused on mitigation and that guidance related to adaptation is lacking.

Interview participants also noted that guidance needs to be continually evolving and that more work may be needed, especially with respect to climate change adaption assessment

requirements. Currently, there are numerous examples of how EA can address climate change mitigation, including industry best practices, technology, assessment methods, and thresholds for LNG facilities; however, the same is not currently available for adaptation as noted by one regulator who stated, "On the adaptation side we don't have as much material or experience".

Approximately half of participants (n=17) indicated that they were familiar with the federal guidance document *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003). While none of the respondents felt that this guidance document was sufficient in its current form, this was largely due to it being an outdated document rather than being poor guidance. Given that it is now fourteen years old, many respondents suggested that it needed to be updated to reflect current scientific knowledge as well as the current legislated GHG emission targets in BC. Of note is that the guidance document does state that "…the methodology described in this document for assessing potential climate change impacts should be recognized as an initial attempt to be tested and refined as new information becomes available" (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003 p.3), and includes provisions that jurisdictional policies and objectives should be integrated into EA practice as they become available. As stated by one participant from industry "…there's going to have to be a modification to that methodology if they want to start looking at it [climate change] on the provincial scale".

Nine participants identified other types of guidance documents they use to consider climate change in EA, while eight participants indicated that they were either were not familiar with any other guidance documents, were not personally required to make use of that type of material, or only used the 2003 federal guidance document (*Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*). Of the nine individuals who stated that they make use of other types of guidance, the variety of documents identified included documents produced by the Pembina Institute, BC Sustainable Energy Association, Pacific Institute for Climate Science, World Wildlife Federation, Intergovernmental Panel on Climate Change, United States Environmental Protection Agency Cumulative Effects Framework, the European Union, terms of reference provided in individual EAs, and BC provincial statutes,

regulations, and policies. However, it was pointed out that the 2003 federal guidance document is one of the few guidance documents available for practitioners that specifically describe how to incorporate climate change in EA specifically. No respondents identified the International Association for Impact Assessment (IAIA) or their climate change guidance document (Byer et al. 2012) as a tool for practice. In general, most respondents were not aware of the variety of documents, as mentioned by other respondents. This speaks to both a lack of consistency and, perhaps, a lack of communication in the practice of assessing climate change in EA.

An overarching theme that emerged with respect to guidance and direction was that the development of an LNG industry in BC is at odds with achieving BC's GHG reduction targets. This 'gap' between the province's commitments and practice was acknowledged by all participant groups, including government. However, the implications of this were interpreted differently based on the respondent's perspective and experiences. For example, as stated by one regulator, BC has "…all the tools…" in place for EA to address climate change mitigation and that criticism of the current mitigation practices are related more so to what the current GHG emissions targets have been set at, stating: "You might not like the target, but that's a separate issue, that's not environmental assessment's problem". Other respondents, including a representative of an NGO, indicated that while the current process is effective in identifying and quantify emissions it is not "…a good process for ensuring that BC stays within its legislated targets". As pointed out by one practitioner "…in the absence of policy or a guideline or a benchmark it's sort of a pretty vague assessment of whether it's [GHG emissions] important or not". Other respondents who were familiar with the LNG intensity target of 0.16 tonnes, such as a respondent from academia, reported that "…it should have been lower".

While most respondents indicated that specific GHG thresholds should be based on current scientific evidence, there were some dissenting opinions to this, including the suggestion that stakeholder values should be used to set benchmarks. Other respondents were more critical of the current process, including a participant from academia who stated that BC has a "…legislated reduction target and they ignore it in environmental assessment". Even when thresholds are defined for GHG emissions as in BC, there is still much conflicting opinion as to how this should

be monitored and regulated, illustrating the complex nature of climate change issues from both a technical and a social perspective.

4.2.3 Current practice

The current practice theme refers to the processes and methods used in the consideration of climate change in EA and includes practices, experiences, and values of respondents. This theme illustrates how climate change considerations are currently applied and potential gaps between theory, policy, and practice. A summary of responses about views and experience regarding the current state of EA practice and climate change is presented in **Table 4.6**.

Table 4-6. Summary of responses for interview questions about the current practice of considering climate change in EA for BC's LNG sector.

Questions[1]	Response			
	Yes	No	Other[2]	Sample Size (n)
Is current practice effective in terms of addressing climate impacts?	1 (11%)	8 (89%)	0 (0%)	9
Is climate change information / impacts adequately presented in EA documentation?	3 (17%)	12 (67%)	3 (17%)	18
Is current EA practice for the LNG industry in BC aligned with provincial policy	5 (28%)	8 (44%)	5 (28%)	18
Has practice / attention given to climate change in EA in the LNG sector changed in recent years?	9 (75%)	1 (8%)	2 (17%)	12

[1]Not all interview respondents provided discrete yes/no answers to questions asked through the course of the interview.

[2]Respondents who were unsure, ambiguous, described the process without offering an opinion, or did not know.

Participants were critical of the current process for addressing climate change in EA, with comments ranging from representatives of legal who stated "…in short it [climate change] has not been considered" to a practitioner who noted "…those issues [climate change adaptation] are really not very high profile in the environmental assessment process". Other criticisms included the lack of sufficient time to meaningfully evaluate project effects, political pressure to approve projects, and inadequate processes by which to evaluate climate impacts. For example, one respondent from academia noted "…that the fact that we are so strongly encouraging of this industry [LNG] unavoidably means that we have parked our environmental implications on the sidelines". Those that were supportive of the current processes were solely representatives from regulatory agencies or members of industry, with the exception of one NGO representative who

highlighted the usefulness of the current process in quantifying emissions. Two respondents with relatively extensive (+10 years) experience in the energy sector commented on the effectiveness of BC in relation to other provinces in application of climate change assessment in EA, with one industry representative stating that "…British Columbia is a leader in advancing climate policies".

Most participants suggested that climate change is one of the most significant cumulative effects issues in current EA practice. This theme emerged strongly throughout the interviews and was one of the main reasons identified as to why current practice is not effective in addressing climate change and that climate change assessment suffers from similar challenges as cumulative effects assessment. One practitioner noted that the assessment of climate change in EA is done "…quite poorly and I think it's symptomatic of how cumulative effects are addressed in general in EA, in BC, in Canada, and perhaps the world". The lack of 'benchmarks' or 'management triggers' for managing climate change impacts was often noted as a challenge by respondents, with one respondent practitioner stating that benchmarks or thresholds "…are the most important tool we have to determine whether something's significant". Indeed, practitioners often felt that the lack of benchmarks was a major impediment to their assessment work when trying to address climate change, with one practitioner representative noting "…in the absence of policy or a guideline or a benchmark it's [the assessment of climate change in EA] sort of a pretty vague assessment of whether it's important or not". The introduction of an LNG intensity target[2] was mentioned as a positive step for the assessment process. As well, many respondents reiterated that the lack of a full supply chain analysis that examines direct and indirect GHG emission sources from extraction to consumption means that the assessment can never be truly effective in examining the industry's real impacts in terms of climate change.

Participants also felt that there was a lack of strong regulation around climate change, and this in turn meant that assessments cannot necessarily impose more stringent requirements in EA. Under these conditions, EA turns into an 'encouragement' to reduce emissions with no driver to

[2] The LNG intensity target was a proposed piece of new legislation that had been implemented at the time of the interviews and not all respondents were aware of its existence at the time of the interviews. Subsequently, the *Greenhouse Gas Industrial Reporting and Control Act* came into force on January 1, 2016 and includes requirements for an LNG facility benchmark of 0.16 tonnes of CO_2 equivalent emission per tonne of LNG produced.

motivate 'minimization' to zero emissions or impose stronger requirements with respect to climate change. Representatives from practitioners and NGOs also stated that because the Liberal government, in power at the time of the interviews[3], supports the LNG industry that EA will not be used to ever decline a project. Indeed, it was noted by representatives of academia, NGOs, and practitioners, that the development of the LNG industry is directly at odds with the government's own legislated GHG reduction targets; with a representative of academia noting that the provincially and federally approved Pacific Northwest LNG project alone would contribute over a quarter of the province's proposed 2030 GHG emission targets. Respondents also identified several other drivers beyond regulation that can affect GHG management, chief among them was the carbon tax. However, as this tax had been frozen at $33 since 2012, it was said to be less of an economic driver for project improvement than it has the potential to be.

The temporal scale of EA for LNG projects with respect to climate change assessment was brought up by participants throughout the interviews. The lifespan of the project is a generally agreed upon timeframe by which to calculate project impacts through EA. With regards to climate change in EA, respondents highlighted two challenges with this temporal scale. Firstly, the time scale of the project may not also be the time scale of impacts when assessing GHG emissions, and different types of GHGs (e.g. methane versus carbon dioxide) behave differently in the atmosphere, potentially resulting in protracted effects. As well, ecological impacts of emissions realised now will undoubtedly last for longer than the lifetime of some projects. For the EA practitioner to make meaningful conclusions, however, there needs to be a certain degree of certainty in the modelling. As pointed out by one practitioner, extending the timelines for assessment introduces greater uncertainty potentially making conclusions indefensible to decision makers.

Participants also raised questions as to whether the intent of EA is to assess the current implications of a project or to project possible future implications. For example, emissions at a current value may be relatively low in the context of provincial emissions, but projections 20 to 30 years into the future, when both nationally and globally there is likely to be greater restrictions on GHG emissions, these project contributions may be much more significant. This

[3] In July of 2016 the Liberal party was replaced by the New Democratic Party in the BC government.

could result in a 'stranded' asset wherein a LNG project becomes a liability rather than a gain for the province as changing climate policies and taxes make these projects economically non-viable. It was also suggested, by a representative of an NGO, that the EA time scales should be aligned with the timelines for the provincial reductions targets, namely 2050. Other participants made the case that timelines for significance determinations should be aligned with the current rates of warming, which are currently much higher than the worst-case IPPC scenario (8.5, IPCC 2014). Although there were many participants who highlighted the challenges with respect to temporal scale, there was no agreement on what the response to this challenge should be. However, numerous different options for a more appropriate time scale were presented, but if and how these could be incorporated into project-level environmental assessment remains an unanswered question.

Most participants were also critical of how climate change is currently presented in project EA documents. There was often a distinction drawn between mitigation and adaption in EA. Many participants felt that the quantification of emissions was adequate, but follow-up was lacking. There were many factors identified which may affect the quality of assessment, including: who was doing the assessment, whether decision makers listened to the results of the EA, and how uncertainty was communicated. This illustrates the multiple technical, social, and economic challenges to addressing climate change in project based EA. One industry representative pointed out that many issues that either directly or indirectly relate to climate change, such as how the environment may affect the project and engineering design for compressor stations, are discussed without ever specifically referencing climate change so that these issues and resolutions may be discussed at multiple points in the planning and EA process.

More than half (n=8) of participants did not think that current EA practice in the LNG industry aligned with provincial policy. The reason was often a perception that the development of an LNG industry would not allow the province to meet its legislated GHG targets. Of those that felt it was aligned (n=5), two stated that this was only because climate change policies have stagnated since 2008, while one respondent from government pointed out that while there was still a gap between targets and emissions that this would be addressed through policies and programs still to be developed Of those who were ambiguous or unsure (n=5), two felt that

policy was under development and it would depend on what came out from the provincial government in the near future.

Most participants (n=9) indicated that they had observed a change in attention to climate change in EA practice in the LNG industry, this included representatives from every stakeholder group. Two respondents (government and a legal representative) noted that the LNG industry was too new to be able to tell if there has been a change in practice or attention to climate change. All participants, with the exception of one, an NGO representative, noted that there *has* been an increase in attention. Public pressure was said to be the dominant rationale provided for this increase, along with political awareness, guidance, pressure from lenders/banks, asset management, and existing and forthcoming provincial guidance and/or legislation. One participant felt that there was an initial push to examine climate change more closely when LNG was first considered for BC but that this has faded over time. In general, participants indicated that there is increasing attention being made to climate change both in society, as well as within EA.

Participants also noted that while BC has, in the words of a legal representative, "…done a lot…," it has not updated its climate change polices or legislation over the past decade, and that the potential increased attention to climate change has occurred despite this stagnation. It was also noted that more topics are constantly being added to EA. These additional areas included in EA generally occur on a decadal interval with climate change as the current popular area of expansion for EA.

Many interviewees raised the issue of 'project splitting', with one practitioner noting "…if an LNG project necessitates a pipeline then the two of them should be looked together…". Further, respondents argued that the real GHG impacts of projects are not evaluated in EA, with a representative from academia noting "…so many parts of the supply chain aren't covered under EA because of project splitting…". As pointed out by another respondent from an NGO, the public does not always understand the rationale for evaluating pipeline and facility projects separately and this may create "frustration" and "suspicion", going on to state that it is a "…little

bit confusing for people as to why this project was split in two and it seemed like it was trying to dodge some of the regulatory requirements…".

In addition to the criticisms and identified challenges, participants identified several positive aspects regarding the current practice of climate change assessment in BC. This included positive responses regarding the Woodfibre LNG project that highlighted its commitment to using electric drives and its 'small scale' relative to other LNG projects proposed in the province. An EA practitioner and an industry participant noted that while the Woodfibre project had "…done a number of substantial things to address concerns about climate change..." and that the project in many ways will "…improve the environment…", these positives were not given as much public recognition or support as respondents would have expected and there remained tremendous public opposition to the project.

The BC Carbon Tax was also noted as a positive step by the BC government to address climate change. However, respondents were critical of the lack of new progressive policies and no increase in this tax since 2008. One industry representative noted that "British Columbia is a leader in advancing climate policies, you know I think that everybody recognizes that the carbon tax has been very successful" while an academic representative noted that BC climate policies "…have stagnated, I won't say we've weakened our climate policies, we've just stagnated, we're not being vigorous in their application or prosecution anymore. Because of that our environmental assessment approach is consistent with a stagnated set of climate actions".

4.2.4 Effects of Climate Change Considerations in EA

This theme addressed actual, perceived, and potential impacts of addressing climate change in EA, including impacts to industries subject to EA, impacts to the practice of EA, and impacts to climate change. A summary of responses to interview questions is provided in **Table 4-7**.

Table 4-7. Summary of responses for interview questions examining the impacts of climate change in EA.

Questions[1]	Response			
	Yes	No	Other[2]	Sample Size (n)
When climate change is included in EA in the LNG sector, does it affect decisions by regulators with regards to permitting and approvals?	4 (22%)	9 (50%)	5 (28%)	18
When climate change is included in EA in the LNG sector, does it influence actions by proponents with regards to studies or consultation undertaken, planning, project design, or monitoring?	8 (44%)	7 (39%)	3 (17%)	18
Does current practice add tangible value to understanding or managing how LNG projects contribute to climate change?	7 (41%)	7 (41%)	3 (18%)	17
Does current practice add tangible value to understanding or managing how project components may be affected by climate change?	5 (50%)	5 (50%)	0	10
Does considering climate change in the EA process for LNG projects in any way affect the feasibility of the project?	3 (19%)	8 (50%)	5 (31%)	16
Does considering climate change in the EA process for LNG projects affect public opposition or support of the project?	10 (56%)	6 (39%)	2 (11%)	18

[1]Not all interview respondents provided discrete yes/no answers to questions asked through the course of the interview.
[2]Respondents who were unsure, ambiguous, described the process without offering an opinion, or did not know.

Only four participants (22%) said that the inclusion of climate change in EA for the LNG industry affects regulator decisions with respect to project approvals and conditions. One practitioner stated that addressing EA in climate change "…makes no bearing on the decisions ultimately", while another practitioner stated, "I think you could probably argue that government has made up its mind and EA process is more about shaping how development occurs versus changing whether development occurs or not". Some responses highlighted an underlying distrust in government and the EA process, with one EA practitioner noting that "…government somewhere has decided that these emissions are okay given the general benefit of LNG to BC or Canada". A representative from the legal sector stated that the current process of how GHG emissions are dealt with has led to a "…lack of confidence in their process". This sentiment was echoed by a respondent from academia, stating: "I don't imagine that we're going to get public confidence in the EA process until we have a process that can speak to climate in a robust way", and by participants from the legal and NGO sector, who questioned the value of emphasizing climate in an EA process that is already flawed, when "government (had) completely misrepresented the climate impact of LNG".

Interestingly though, eight participants (44%) indicated that including climate change in EA impacted proponent's actions in terms how they designed and assessed their proposed project. Of these eight respondents, half indicated that EA was still not going far enough in addressing climate change. The Woodfibre project were provided as examples of projects being improved in response to climate change considerations and the LNG Canada project provided as an example of a project being approved despite findings of a significant adverse effects due to GHG emissions. In the Reasons for Ministers' Decision[4] for the LNG Canada project, it was stated that GHG emissions, while potentially contributing 6.6% GHG emissions to 2011 provincial GHG emissions totals, would be managed through the EAC conditions (one of which requires a GHG Management Plan) and existing regulatory regimes, including the carbon tax and the GHG intensity benchmark of 0.16 tonnes of CO_{2eq} per tonne of LNG produced.

While approximately half of participants (n=7) felt that EA did provide some benefit to managing climate change effects from LNG projects, it's unclear whether the motivation for managing climate change is a result of the EA process, or other legislation, or public pressure. If EA is considered a platform in support of public consultation and legislation, then it could in fact be supporting these drivers. It was noted by both legal and regulator participants that including climate change in EA often leads to some sort of conditions within the EAC regarding emissions reduction. As well, respondents who felt there was some benefits generally agreed that those benefits were limited to the understanding and managing of emissions, rather than climate change adaptation. One of the challenges identified in having climate change considered in project level EA is scale, wherein a local assessment is trying to be used to address a global issue, making it difficult to effectively identify meaningful assessment metrics, mitigations, and conclusions. While half of respondents did see some value in this, in terms of supporting broader discussions and potential policy creation, the other half of respondents felt there were no benefits because climate change is either not included or not adequately weighted during the EA process. One respondent from academia, for example, commented that "…if climate change weighs in at all it's only a one-bit part in that process…" and that while climate change is considered in EA it's "…just not yet exerting enough leverage on the process to actually shape outcomes". Three respondents did not know if there was any tangible value added.

[4] Available at https://projects.eao.gov.bc.ca/api/document/58869076e036fb0105768b57/fetch

Participants were generally unclear as to whether current practice adds tangible values to understanding and managing how project components may be affected by climate change. The majority of responses focussed on mitigation, as represented by the identification and reduction of GHG emissions, versus adaptation. This correlates to responses provided by regulators, acknowledging that while they stated there are fairly comprehensive plans and programs for addressing mitigation, further work is required to provide policies and programs regarding adaptation.

Only 19% (n=3) of participants indicated that including climate change assessment and mitigation requirements in EA adversely impacts the feasibility of projects; most suggested that it likely has no impact whatsoever. Respondents commented that while climate change considerations in EA *should* impact project approvals, it hasn't done so thus far. One example mentioned was the Canada Export Terminal, which was approved even though it was determined that it would have a significant adverse effect in terms of GHG emissions. A participant from academia noted that the BC government "…actually found an un-mitigatable, significant environmental effect and still approved the project without really proper reasons". Although participants generally were not familiar with the then proposed *Greenhouse Gas Industrial Reporting and Control Act* (enacted January 1, 2016), setting a GHG intensity target for LNG facilities of 0.16 CO_2 equivalent tonnes for each tonne of LNG produced, those that were indicated that the target there will likely be an economic cost to proponents to implement this new benchmark, but it would not negatively impact the economic viability of projects. It was suggested that the GHG benchmark may in fact benefit proponents because it provides greater regulatory certainty.

Most participants (n=10) felt that including climate change in EA has the potential to impact public opposition or support of a project. Many felt that it was a way to increase public confidence of the process, if not the project itself. It was suggested that excluding climate change from EA often leads to increased public opposition to projects, while including it may increase a proponent's social licence to operate. Those who felt that it did not impact public opinion (n=6) often cited the Woodfibre LNG project as an example of a project that meaningfully considered climate change and made project improvements with respect to GHG emissions by moving to

electrification, but was still not supported by many the public. It was suggested that this indicates that the consideration of climate change in a project does little to affect the opinions of those who are fundamentally opposed to a project – there are those who will not support a project regardless of climate change considerations, and may in fact use climate change considerations, when considered in the EA, as a flag to represent other agendas. One EA practitioner explained that climate change "...it's not really the concern…" but is used as a lever to address other local concerns related to development, or when they simply don't like the EA process or project. A regulator added that, for the public who doesn't want "…any new greenhouse gas emissions sources," there is "… no way for an environmental assessment to deal with that kind of an approach; there is a fundamental disjoint …between what the common view and the descending expectation of what EA is".

4.2.5 Towards Improved Practice

This theme explored how climate change can be more effectively considered both in EA and through other tools and processes. A summary of responses to interview questions examining how practices for assessing and managing climate change can be improved is provided in **Table 4-8**.

Table 4-8. Summary of responses for interview questions about how EA practice for considering climate change can be improved.

Questions[1]	Response			
	Yes	No	Other[2]	Sample size (n)
Is there a need for even greater consideration of climate change in LNG sector EAs?	13 (72%)	5 (28%)	0	18
Is project level EA the right scale for assessing, understanding the significance of potential impacts, and effectively managing climate change issues in the LNG sector?	12 (60%)	3 (15%)	5 (25%)	20

[1]Not all interview respondents provided discrete yes/no answers to questions asked through the course of the interview.

[2]Respondents who were unsure, ambiguous, described the process without offering an opinion, or did not know.

Most participants (n = 13) identified a need for greater climate change consideration in EA, although many of these responses appeared to be motivated by a desire to curb GHG emissions rather than a need to improve EA practice. Representatives from government, industry, and practitioners (n=5) who thought greater inclusion of climate change in EA was not required cited

as reasons that: BC currently has comprehensive tools to evaluate climate change considerations; that other regulatory tools would be more effective than EA; or that current practice is sufficient. It was pointed out by several NGO and practitioner participants that the risk of greater inclusion of climate change in EA may be that the real impacts of climate change due to the LNG industry will become known, resulting in greater public opposition to the industry and to a government that supports the industry. Others suggested that adverse impacts could include effects to the economy and jobs, although most thought this risk was either perceived or negligible at most. Several participants stated that there would be no risks, and only benefits from increased climate change considerations.

Most participants (n=12) indicated that project level EA could be the right tool for considering climate change impacts for the LNG sector, with the caveat that it should be coupled with higher level policies and programs to assess and manage climate change. No participants responded that project level EA on its own was sufficient to address climate change. One respondent from an NGO felt that project level EA was "pointless" because it does little to address climate change in the absence of strong legislation and incentives around emissions reductions. Several practitioners who felt that project level EA was not the right scale went on to elaborate that higher-level programs at the provincial and or federal were required, not negating the usefulness of EA though when coupled with higher level government plans and policies. Many participants felt that higher level programs with a broader scope were needed, for example a strategic environmental assessment (SEA) for the LNG industry or national targets and programs.

On the other hand, some participants felt that regulatory processes post-EA could be more effective at managing climate change, with one NGO representative stating that "…if you have like a strong regulatory environment you don't really need that process [EA]". This was supported by a practitioner who pointed out that there is an inherent amount of flexibility within projects during EA with "…final details to be resolved at the permitting stage" and without a correspond strong regulatory environment this can lead to "…a lot of EA commitments that somehow fall through gaps at the permitting stage…". A regulator also pointed out that "…the environmental assessment, it's not in a business of setting new requirements or new policies, it's

the Ministries and the government that set the policies and the legislation and then the EA is a checking tool".

Cumulative effects were repeatedly brought up as an area of concern. Many participants (n=5) did not directly answer the question of whether project level EA is the 'right' scale to examine climate change issues for the LNG sector, but did discuss some of the issues with scale in general including the need for higher level assessments and the challenges of dealing with a global issue at a project level. Most participants (n=12) felt that multiple scales are required to effectively manage climate change with respect to the LNG industry. Approximately half of respondents felt that it should be the federal and provincial government taking a lead on these initiatives, while others felt that a consortium that involves multiple groups and scales, possibly including First Nations, as well as proponents and other stakeholders is required. One suggestion by a representative from industry was to deal with climate change in EA similarly to how species at risk are addressed, wherein a framework is in place for a national interest to be addressed at a project level.

Participants also provided numerous suggestions for improving how climate change is addressed in EA. These suggestions included having a specific regulator tasked with addressing GHG emissions, providing improved guidance documents to proponents and EA practitioners, implementing clear thresholds and targets for GHG emissions, and improved communication within and between governments. Additionally, several other tools for addressing and managing climate change were proposed, such as cumulative effects assessment, SEA, carbon budgeting, and life cycle analysis. Using economic instruments outside of the EA process was also suggested by one respondent as a more effective method to addressing climate change mitigation and adaptation. This could include project insurance or lender guarantees around climate change risk, like what is currently done regarding earthquakes and other natural disaster risks.

The need to adapt to future scenarios regarding climate change, energy security, and EA was also a common suggestion. As pointed out by one NGO respondent, "…we're committing ourselves in a sense to an industry that has a lifetime of you know thirty years as a minimum…" and this may present future risk and challenges in achieving climate change management goals. For

example, the LNG PDAs signed between individual LNG projects and the Government of BC were noted by one legal representative as being a potential "contingent liability" for the public in BC to be responsible for GHG emissions reductions that will be both challenging and difficult to achieve. The uncertainty about what the price of carbon will be in the future was also noted, as well as the legislation and regulation that may be put in place to achieve emissions reductions targets as the provincial, national, and global scales.

New LNG technologies that include electrification were discussed by many respondents as a way to address this potential uncertainty and to also reduce overall emissions from the LNG industry. However, this was acknowledged to have numerous economic, technical, and social challenges to fully implement. Additionally, several respondents, including a representative from an NGO, highlighted that there are "…risks of having an industry that has relatively high emissions in a world that's trying to reduce emissions…" It was acknowledged that further work is required to adequately address climate change adaptation requirements, with one respondent representing regulators stating, "…on the adaptation side we don't have as much material or experience".

Chapter 5 Discussion

5.1 Current and Evolving Practice

The first phase of this research presented the regulatory context within which climate change is examined in EA for the LNG sector in BC. The results highlighted numerous laws and regulations in place to reduce GHG emissions, including emissions specific to the LNG sector. Additionally, it was shown that climate change is considered, to some extent, in all phases on the EA process for most LNG pipeline and facility projects in BC. The interview results, however, highlighted gaps in climate change legislation and regulation and in the practice of EA based on the experience and perceptions of the interviewees. At times, results from the analysis of EA documentation contrasted with the experiences and perceptions of many of the stakeholders interviewed, who spoke strongly about the lack of consideration climate change is given in EA and the lack of government legislation and regulation.

It can be inferred from the interview participants' responses that there is a gap in the understanding and implementation of current practice, including EA requirements and existing regulation and policy related to climate change. This is consistent with Kågström and Richardson (2015), who speak about the challenges to integrating new issues into EA, including the challenges associated with interpretation, guidance, communication, and institutional frameworks. British Columbia and Canada are addressing climate change through many avenues, including, for example, a carbon tax, a legislated LNG intensity target, and requirements in project-specific EA. Many interviewees, however, including both those who were critical and those who were supportive of BC's current approach to climate change in EA, were unaware of the legislation and practices in place, such as BC's LNG intensity target and various requirements in project-specific Application Information Requirements.

Limited knowledge about legislation, guidance, or practices to address climate change is not unique to the BC context, or specific to project-level EA. Vicente and Partidário (2006), for example, highlight the challenges in communicating technical information to the public and to decision makers within the context of SEAs. Runharr (2016) discusses further challenges in this

regard, within the context of environmental policy integration, but identifies EA and SEA as possible tools to improve knowledge translation and integration. What may be required, especially in the BC context, is a program to improve EA literacy coupled with a more comprehensive integration of policies and regulations with EA requirements. The federal expert review panel offered several relevant findings and recommendations in this regard, specifically noting that "…as a learning process, it builds literacy in IA processes and builds capacity…" (Gélinas et al. 2017, p.4).

This research also illustrated variability in how climate change is considered in EA and the language used for doing so. For example, in some instances of project GHG emissions accounting, wetlands are discussed as a carbon sink, while in others they are not. There was also a great deal of variability in the terminology used to describe climate change, most frequently with respect to adaptation. EA is a growing field of practice and this variability may be an indicator of evolving practice in response to experience or of the inherent flexibility in EA. Though, research in other fields of EA, including how uncertainty is analyzed and communicated (Leung et al. 2016; Pavlyuk et al. 2017), show similar variability in terminology and practice and argue that such variability poses a significant barrier to learning from one EA application, or jurisdiction, to the next and may risk unevenness in application across different projects and EA systems. For EA to be meaningful some flexibility is necessary so that identified valued components - what is assessed, and how - are relevant to the project, place, and stakeholders involved; but, at the same time, a degree of consistency is required to ensure an accepted standard of practice and to facilitate the transfer of information and knowledge from one assessment to the next.

Runhaar (2016) posits that while the strength of EA may lie in its legislated foundation, this in turns can create a lack of flexibility wherein benefits cannot be maximised. However, the perception of many interview participants was that EA practice for the LNG sector was driven in large part by political will, and in this context flexibility in EA was viewed as negative and placing EA at risk of influence due to political and economic pressures. The is aligned with findings elsewhere in the literature that show that the linkages between information and decision making are not always clear, nor trusted by the public, and a growing body of work that calls for increased transparency in EA (Gélinas et al. 2017; Runhaar 2016; Tenney et al. 2006).

Results also indicated a perception that how climate change information is considered in decision making by statutory decision makers remains unclear to stakeholders. This is a persistent issue across EA scholarship, and numerous reviews have been critical of the extent to which EA actually influences decision making (Bond et al. 2016; Leknes 2001; Zhang et al. 2013). The document analysis showed that climate change appears in all phases of the EA process; however, how this information is considered and the links to project requirements was not always explicitly stated. The federal guidance document, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, while noted frequently in document analysis and interviews, did not seem to provide the level of guidance that is stated in both the literature and by interviewees as necessary for effective and consistent practice, nor is it wholly aligned with the guidance provided by the IAIA (Byer et al. 2012). Cashmore et al. (2015) have also highlighted some of the challenges with guidance documents in EA, and the risk of bias both in guidance and in practice.

However, when looking at project specific AIRs, there was a much higher level of detail provided with respect to how climate change mitigation and adaption should be presented in the Application for an EAC, but these requirements are not always consistent across LNG projects. This lack of consistency means that how climate change mitigation and adaption is assessed and managed may differ between projects, and industries, subject to EA. This may lead to a lack of certainty for industries subject to EA and a lack of confidence and trust from the public in the EA process. To address this issue, what might be required is greater standardization of climate change assessment processes in EA while maintaining flexibility in mitigation and adaptation tools in order to meet climate targets and minimize costs to both the public and industry. Morgan (2017) has written about how the use of 'best practice' can be applied to standardize international practice, while acknowledging the risk of 'stunting creativity' through over mechanization of practice (p.81). Ball et al. (2013), in the context of aquatic effects assessment in the South Saskatchewan River watershed, similarly argued the value added of greater consistency in the project-specific guidance for project proponents, ensuring not only a minimum standard of practice but also the ability to compare results across assessments and over time.

5.2 Implications of Climate Change Considerations in EA

Some LNG projects that have, or have tried, to make a switch to electrification for facility operation were faced with barriers both from a lack of supporting electrical power infrastructure and from continued public opposition to the project. An LNG facility requires a large amount of energy to cool natural gas into a liquid state, as well as to operate site infrastructure. In 2014, the BC government announced a new megawatt per hour rate of $83.02 for LNG facilities connected to the BC Hydro grid, while other industrial users were charged a rate of $53.34 (Government of BC 2014). While the BC government indicated that this rate ensured other BC Hydro users would not subsidize any costs associated with LNG use of the grid, it also presented a financial disincentive for facilities to connect to the grid, especially in areas where the cost to connect to the grid (i.e. build and/or upgrade transmission lines) was already large due to distance and possibly challenging terrain. The costs of connecting to the grid for some projects, coupled with potential challenges in gaining support from the public and Indigenous groups (who often have historical grievances with transmission lines built on their traditional territories), can create an insurmountable barrier for some of the projects proposed in BC. It can also create an uneven economic field, wherein projects proposed closer to major centres, such as Woodfibre, have an economic advantage through electrification over more remote projects, such as the Prince Rupert LNG project.

Some of the key risks identified in this research associated with increased consideration of climate change in EA include increased timelines for assessments and reviews and increased scope of the assessment and thus increased cost. Some respondents also noted that if climate change was more fulsomely examined in EA for LNG projects it would show that the industry was not as 'green' as the previous Liberal Party government had publicly stated, leading to the potential for adverse political impacts to the Liberal Party. As well, these risks are in direct opposition to works calling for more efficient EA processes (Bond et al. 2014; Morgan 2012), including the federal reform in 2012 that resulted in the updated *CEAA 2012* (CEAA 2014a). Additionally, Bernauer (2013) has described some of the political challenges faced with implementing climate change management initiatives, including the positive correlation between GHG emissions and the economy, the temporal scale and unequal distribution of climate impacts, and political uncertainty. However, what emerged more strongly than political risk from

this research was the lack of public trust in BC's EA process and in government to meaningfully address climate change.

Australia has had an LNG industry for over 25 years and experiences there can provide some insight into the future challenges and opportunities for the LNG industry and regulatory framework in Canada. It is recognized in Australia, for example, that to attract LNG investment cooperation from all levels of government is required (Pritchard 2007). The LNG industry is highly susceptible to demand change due to changes in overall energy demand, as well as to changes in competing energy sources. The relatively high cost of LNG makes it more susceptible to economic risks, including the costs associated with environmental regulations and compliance, public opposition, and '…retrospective changes in requirements" (Grafton & Lambie 2014, p. 7-8).

In their research, Grafton and Lambie (2014) report that to attract investment and further develop the LNG industry in Australia, a social licence to operate was a necessity. The authors stated that communities must trust the "…approval, development, and monitoring processes of government regulators and proponents…" for this social licence to be gained (Grafton & Lambie 2014, p.11). Providing a more fulsome and transparent framework for when and how climate change is considered in the approval process for major projects may be one step to achieving this social licence in the BC context, as well as providing greater certainty to project proponents about costs and timelines associated with the provincial EA process. However, the increase in climate change considerations does not necessarily have to occur solely within the EA process. Other tools that would allow for a more fulsome consideration and management of climate change are available.

5.3 Opportunities and Solutions beyond Project EA

Project-based EA does have a role to play in addressing climate change in the LNG sector, but as shown in this research and demonstrated elsewhere in the literature (e.g. Agrawala et al. 2012; Sok et al. 2011), project-based EA cannot resolve all climate change issues. Gray (2015), for example, has suggested that the question at hand for project-based analysis should not be whether a project contributes to climate change per se, but rather whether the project creates

GHG emissions, thusly avoiding the scale and inherently causal relationships in evaluating climate change that reach far beyond the scope and scale of the assessment and decisions made for any single LNG project. In the BC context, there appears to be a misalignment between practice and perception (or expectation), highlighting the need for a clear framework and consistent guidance for how the significance of individual LNG projects is interpreted, and assessed, in a broader climate change context (Jones & Morrison-Saunders 2016). This encompasses numerous factors at both the project-specific scale and beyond – many of which cannot be controlled by individual project proponents, or addressed within the scope of a single, project-based regulatory decision.

Project-level EA is intended to address impacts that are a result of a single, specific project. Climate change, however, is fundamentally a global cumulative effect and, as such, single projects are rarely, if ever, found to be contributing at a meaningful scale. BC has in some part addressed this scaling issue through the setting of GHG emissions intensity targets for LNG facilities, notwithstanding criticisms about the efficacy of the stated targets, and through identification of smaller, provincial GHG emissions targets that individual projects can be measured against. The EAO (2016) "…recognizes that the impacts of GHG emissions must be addressed globally, and that it is not possible to estimate the impacts of an individual project's emissions on global climate change". In some instances, the EAO has identified a significant adverse effect to climate change as a result of project emissions, such as the Prince Rupert Gas Transmission project and LNG Canada Export Terminal. However, BC has not identified a threshold or proportion of the provincial GHG targets that would result in a significant adverse effect determination. As such, the application and evaluation of climate change in EA remains fundamentally ad hoc. This highlights the challenge that government decision makers and EA practitioners face in trying to undertake a meaningful assessment of impacts to, and from, climate change at the project scale. Reconciling the issues of scale between climate change and source emitters remains a challenge, but some solutions are available external to project assessment.

One possible solution is to conduct a SEAs for the LNG industry. Strategic environmental assessment is a tool for applying impact assessment at the level of policies, plans, and programs to support informed decision making about subsequent development actions. Strategic

environmental assessment can be applied within the context of resource development regions, or to resource-specific sectors (Canadian Council of Ministers of the Environment 2009). Previous researchers have noted the value of SEA for identifying, early on in policy and planning, the implications of development decision in a much broader social, political, and economic context prior to project decisions being taken (Chetkiewicz & Lintner 2014; Doelle et al. 2012; Noble 2017).

Implementing a SEA for the LNG industry prior to commencing project scale EA would allow for public discourse and an evaluation of the climate change implications of sector-wide LNG development, prior to planning and investment at a project level. The valued components, assessment methods, and significance thresholds for the sector could be pre-determined so that the industry making investments decisions at the project level are assured consistency and transparency in what would be required in their EAs, including the limits, targets or thresholds. This early consideration and evaluation could also promote public engagement, potentially leading to an increase in social licence for the industry. Others have similarly noted that SEA can be a useful tool for integrating climate policies into resource sectors and project development planning (Wende et al. 2012), and indeed may be more effective than project level EA in addressing climate change (Posas 2011). Westcoast Environmental Law and the Northwest Institute for Bioregional Research (2016) have similarly advocated for the use of a regional SEA in northwest BC to address both the direct and indirect effects of LNG development, and similar calls for SEA have emerged in other resource-intensive regions across Canada (Noble 2017). Additionally, the federal expert review panel made recommendations related to implementing a new strategic impact assessment model to complement the existing *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The panel recognized that project EA often becomes a 'battle-ground' for strategic issues that have not been resolved at the policy, plan, and program level. To address this, the panel recommended a 'strategic impact assessment model' that would provide additional guidance and apply when a federal initiative may impact project EA and it is unclear how the initiative would apply in EA, such as for species at risk, climate change, and sustainable development (Gélinas et al. 2017).

That said, a suite of other tools, beyond any form of impact assessment (project or strategic) may be the most effective way to address climate change in relation to the LNG sector, or any other

industrial sector, including economic tools such as financial risk assessments and insurance, to global emissions caps. Some of these opportunities have already been acted upon by the federal government, including a mandatory national carbon scheme of either a tax or cap and trade that meets a minimum of $10 per tonne of carbon by 2018, rising by $10 per year until reaching $50 in 2022 (Government of Canada 2017). The BC carbon tax was generally seen by the interview participants as a positive force in minimizing GHG emissions, with the main criticism that it is currently too low for the full benefits of the tax, including reducing emissions and spurring innovation, to be realized. While the carbon tax and other economic tools and instruments are external to the EA process, the pressure that it exerts on industry, especially at higher costs, would likely shape the type of projects and technologies that are seen as economically viable for an industry. There is a general consensus that climate change can and should be incorporated into EA, particularly in terms of mitigation assessment (Burdge 2008; Byer et al. 2012; Enriquez-de-Salmoneca et al. 2016), but economic tools may be more effective than EA in managing climate change, especially in the short-term.

Chapter 6 Conclusion

This research set out to examine the potential impacts of incorporating climate change considerations in project level EA regulations and practice within the context of the LNG industry in BC. To accomplish this, the research sought to:

- examine how climate change is currently considered in EA for the LNG in BC,
- assess the benefits and implications of current practice, as well as potential increasing consideration, of climate change, and
- identify opportunities to improve how climate change is evaluated EA for energy development projects.

Climate change is one of the most pressing issues globally. Each year the effects of climate change are felt more strongly around the world, with growing social, health, environmental, and economic implications (IPCC 2014). The results of this research indicate that while addressing climate change remains a challenge, there are a number of potential tools that could be used to help reduce impacts to and from climate change. EA clearly has a role to play in addressing impacts to and from climate change, but what emerged strongly from this research, and as supported by the literature (Enríquez-de-Salamanca et al. 2016; Sok et al. 2011), is that EA should not be the only tool in play to accomplish this. EA is recognized as a valuable tool for identifying and mitigating potential adverse effects associated with major projects, but if EA is not coupled with other tools and actions at multiple scales then it is unlikely to be effective at tackling climate change issues. It also highlighted the lack of trust the public has in the EA process to meaningful address what is arguably one of the greatest environmental and social threats.

The recent federal EA review and policy direction shifts giving more attention to addressing climate change, such as considering upstream GHG emissions in EA and implementing a national carbon pricing strategy, shows some promise of creating a more comprehensive and coordinated national strategy to address climate change, both through EA and other mechanisms. The province of BC was a leader in developing pro-active climate policies in the early 2000s,

with the creation of the carbon tax and other climate policies and regulations. There are indications that the new NDP government will re-ignite this leadership both in EA, through objectives outlined in the Minister mandate letter including, a requirement to 'revitalize' the EA process, increase the carbon tax, and renew the Climate Leadership Team (Horgan, 2017). What this means for EA and for industries subject to EA remains uncertain. The drop in global LNG prices has led to a stagnation of the industry in BC, with not a single LNG project yet to be constructed. At the same time, other energy projects in the province, such as the Site C project (hydroelectric) and the TransMountain Expansion project (oil pipeline), are facing strong opposition and criticism, both from the public and from the newly elected provincial government. The province of BC is facing the same challenges faced by countries throughout the world - how to reconcile growing energy demands with a need to reduce GHG emissions and maintain a stable economy. How the energy needs of future generations will be met whilst simultaneously meeting climate change mitigation targets and adaptation imperatives remains a challenge; however, EA can, and should, play a role in reconciling these seemingly divergent goals.

The major recommendations that emerged from this research are for:

- A public and stakeholder EA literacy program so that people are aware of current practice and can more meaningfully participate in the discourse on how to address climate change both in EA and in society;
- The use of life cycle analysis for industries to better understand and communicate the full picture of climate change effects;
- More robust economic tools and incentives to motivate emissions reductions, such as the carbon tax; and
- A clear framework to communicate to the public and to stakeholders how their input is considered in the EA process and the criteria used by decision makers in EA.

The goal of the above noted recommendation are to improve EA practice for considering climate change, to make climate change mitigation and adaptation strategies more effective, and to improve public confidence in the EA process.

Without another avenue for the public to voice their concerns, EA will constantly be tasked with dealing with issues that are beyond the scope of an individual EA. Indeed, many of the deficiencies noted by Barker and Wood (1999) in their analysis of European EA's are still echoed today, nearly twenty years later. Moving forward, additional research into the role that SEA can and should play in addressing climate change, especially for new and emerging industries, is needed. However, this must be complemented by research into the application of other instruments to address climate change, including economic instruments, and how they can be woven together to form a more robust, comprehensive, and scale-relevant framework for addressing climate change mitigation and adaptation.

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Appendix 1

UNIVERSITY OF SASKATCHEWAN

Interview Guide
The Effects of Climate Change Considerations in Environmental Assessment
- Case Study of British Columbia's Natural Gas Sector –

Preface to interview:

- The interview will be recorded.
- Not all of the questions may be relevant to you and you may also choose not to answer any questions.
- When referring to climate change within the interview the term encompasses GHG emissions as well as other potential direct and indirect climate change impacts (e.g. effects of the environment on the project and effects of climate change on other Valued Components).

QUESTIONS	EXPLANATIONS, PROBES, & FOLLOW-UPS
Theme 1: Legislation and Regulatory Requirements	
1. How would you describe current legislative / regulatory requirements for addressing climate change in environmental assessment (EA) in BC's liquid natural gas (LNG) sector?	• Is it adequate / sufficient? • Is there any regulatory uncertainty or ambiguity?
2. Are climate change requirements in EA evenly applied across the LNG industry?	• For both pipeline and facility projects? For upstream development? • If not, why do you think this is?
3. Have climate change regulations and / or requirements from the BC Environmental Assessment Office (EAO) changed in recent years? If so, how?	• Can you provide an example(s)?
Theme 2: Guidance Documents and Regulator Direction	
1. Is current guidance from the BC EAO for how to consider climate change in EA sufficient?	• Including direction for assessment methods, determination of significance, and mitigation / adaptation requirements.
2. Are you familiar with the 2003 document: *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*? Is the guidance it provides sufficient?	• Are any updates needed? • Do you think that current practice meets, or exceeds, the goals of this document (i.e. increase attention and awareness of GHG emissions from projects; ensure consistency with broader climate change policy; increase consideration of less emission intensive design and operation; help proponents manage and reduce climate change risks; and assure the public that climate change considerations are being accounted for)?

3. Are there other standards or guidance documents you use in order to evaluate or assess climate change in EA?	
Theme 3: Current Practice	
1. How would you describe the current practice of addressing climate change in EA in the LNG sector?	• Is it effective in terms of addressing climate impacts? • Can you comment on the effort required from proponents in order to incorporate climate change into their EA submissions (e.g. project description, environmental impact statement)? • How do regulators contribute during EA with regards to climate change?
2. If or when climate change is considered in EA in the LNG sector, what is typically the focus?	• For example, effects of the project on climate change or effects of climate change on the project or effects of climate change on other valued components identified by the project? • Where do you think the assessment focus should be placed?
3. How are significance determinations made with regards to potentially adverse climate change effects? Including emissions and / or impacts. How should they be made?	• For example, should GHG emissions significance be based on provincial, federal, or national totals and targets? • What time scale or climate scenarios should be used for future predictions?
4. Is climate change information / impacts adequately presented in EA documentation?	• Can you provide an example?
5. Is current EA practice for the LNG industry in BC aligned with provincial policy? Federal?	
6. Has practice / attention given to climate change in EA in the LNG sector changed in recent years?	• If so, what do you think has motivated the change?
Theme 4: Impacts of Climate Change in EA	
1. When climate change is included in EA in the LNG sector, does it: a) Affect decisions by regulators with regards to permitting and approvals? b) Influence actions by proponents with regards to studies or consultation undertaken, planning, project design, or monitoring?	• In what ways? Can you provide an example(s)?
2. Does current practice add tangible value to understanding or managing how LNG projects contribute to climate change?	• If so, in what ways? Can you provide example(s)?

3. Does current practice add tangible value to understanding or managing how project components may be affected by climate change?	• If so, are these understandings only at a project level, or also regional, provincial, national and / or global?
4. Does considering climate change in the EA process for LNG projects in any way affect the feasibility of the project?	• Do regulatory or additional process requirements or consideration impact project budgets or timelines? If so, can you provide an example(s)? • Does it affect public opposition or support of the project?
5. The November 2014 *Greenhouse Gas Industrial Reporting and Control Act introduced* a carbon intensity target of 0.16 carbon dioxide equivalent tonnes for each tonne of liquefied natural gas produced. How do you think these LNG CO_2 intensity targets will impact the BC LNG sector?	
Theme 5: Towards Improved Practice	
1. What are some of the challenges or obstacles faced when considering climate change in project-based EAs: a) By governments or regulators? b) By project proponents? c) By EA practitioners/consultants?	• For example: technical or data issues, dealing with uncertainties, scale issues, capacity or resources, etc.
2. Is there a need for even greater consideration of climate change in LNG sector EAs?	• What may be the risks of doing so – either real or perceived?
3. Is project level EA the right scale for assessing, understanding the significance of potential impacts, and effectively managing climate change issues in the LNG sector?	• Or should this be an industry-wide, provincial or national-scale matter?
4. Who, ultimately, should be responsible for the assessment and management of LNG sector contributions to climate change?	
5. Is project level EA the 'right tool' for assessing climate change impacts in the LNG sector?	• If not, what other options are there, either existing or perhaps new ones? • If so, how do you think EA can most effectively be used to address climate change?
Conclusion	
1. Do you have any other comments or information you would like to add?	
2. Can you suggest any other professionals who may be interested in participating in this research?	• Names and contact information.

Appendix 2

UNIVERSITY OF SASKATCHEWAN

The Effects of Climate Change Considerations in Environmental Assessment
- Case Study of British Columbia's Natural Gas Industry-

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Thank you for agreeing to participate in this study. Please review this form and feel free to contact me with any questions you might have.

Purpose and Procedure: This research examines the impacts of climate change considerations in environmental assessment (EA), including i) the perceived risks and benefits of increased climate change considerations in EA; ii) opportunities and challenges to addressing climate change in EA processes; and iii) the overall effectiveness of project EA for addressing climate change. These objectives are being examined within the context of British Columbia's liquid natural gas (LNG) industry.

You are invited to assist in the study by participating in an interview to discuss your knowledge about and experience with the above issue. Speaking with those directly involved in EA and the LNG industry will provide important insight and context for this research. The interview is designed to take approximately one hour. With your consent, the interview will be audio taped to facilitate data analysis.

Potential Risks: You are being asked to provide your expert judgement / experience and, as such, there is minimal personal risk.

Potential Benefits: There are no direct benefits to you personally for participating in this study. The results will be used as part of a graduate research project at the University of Saskatchewan and shared with all study participants and the broader research community.

Storage of Data: All information that you provide will be stored securely in the office of the student's supervisor (Dr. Bram Noble) at the University of Saskatchewan for five years, after which it will be destroyed.

Confidentiality: The information you provide will be used to produce reports for publication in scientific journals and presented at conferences and workshops/meetings. Results will also be shared with the industry and regulatory community. Your personal identity will be kept confidential. You will be identified only by your affiliation (e.g. industry, government). Only aggregate data will be presented in the research results.

Right to Withdraw: Your participation is voluntary, and you may withdraw for any reason, at any time, without penalty of any sort, up to one month following completion of the interview.

After one month, it is likely that research dissemination will have already occurred. You may refuse to answer individual questions.

Questions: If you have any questions concerning the study, please feel free to ask at any point. You are also free to contact the supervisor or research student at the numbers provided above if you have any questions at a later time. When the study is complete, a short report will be made available to you that outlines the research findings in addition to other scholarly dissemination.